APPENDIX K

ADDITIONAL EVIDENCE

SAN ANTONIO EAC REGION ATTAINMENT DEMONSTRATION

MARCH 2004

Appendix K

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Alternative Fuel Survey

Introduction

Local alternative fuel surveys have been conducted in 2001, 2003, and 2004 by staff of AACOG, which inventoried the AFV fleet in the four SAER counties. These surveys provided information on the number of AFVs, specific fuel type, the percentage of time that they operate on alternative fuel, the number of days per week they typically operate, and an estimate on how many vehicle miles traveled (VMT) were accumulated by each vehicle for 2007.

The results indicated that there will be 2,533 potential AFVs by 2007, however some of AFVs will never use any alternative fuel. As a result, only 2,131AFVs were included in the final modeling. Once the survey showed a 0% usage rate of alternative fuels for any AFV, the vehicle was removed from the calculations. The survey results were used to assess the effectiveness of the 2007 AFV fleet at reducing ozone precursor emissions by applying the EPA's MOBILE6 model to generated AFVs emission factors. A total of 28,456,349 VMT per year was determined for the AFV fleet in 2007. Final analysis of operation of the 2007 AFV fleet indicates that this fleet is responsible for emissions reductions of 193 lbs./day of VOC and 172 lbs./day of NOx.

While these estimated reductions are not overly sizeable, they do illustrate that a switch to alternative fuel vehicles will result in the reduction of ozone precursors in addition to reducing our nation's dependence on foreign oil. As alternative fuel technology advances, refueling infrastructure expands, and the use of alternative fuels becomes more acceptable, the emissions reductions resulting from the utilization of an AFV fleet in the four SAER counties should become more significant.

The first step in the analysis process was to determine what alternative fuel types are being used in the San Antonio region. The alternative fuels considered in this study were liquefied petroleum gas (LPG), compressed natural gas (CNG), biodiesel, ethanol, and electricity. A questionnaire was distributed to both public and private entities seeking information on how many AFVs are in operation, what types of fuel they are using, and how many vehicle miles traveled (VMT) were accumulated by using each vehicle throughout the year.

The results 2004 survey were supplemented by information gathered from the 2000 Alternative Fuel Survey and the 2001 Clean Cities Report for organizations that did not respond to the 2004 Alternative Fuel Survey. The following pages provide an example of the survey materials distributed in 2004. The survey information is followed by the results.

AACOG
Alamo Area Council Of Governments

2004 Alternative Fuel Vehicles Survey

AACOG is updating its inventory of alternative fuel vehicles (AFVs) to continue analyzing reduction of ozone-forming emissions due to the use AFVs. This inventory will be used to monitor progress in use of AFVs, as well as, assessing the role that AFVs can play in the ongoing efforts for improving the region's air quality. Please complete the following table with required information and return it by **May 20, 2004**.

Use the following instruction and information to fill out the table. If you need additional information, please feel free to contact our technical staff at (210) 362-5317.

Vehicle Class: Please classify vehicles as either light-duty or heavy-duty.

Light-duty: All vehicles weighing less than or equal to 8,500 lbs. (such as passenger cars, trucks and vans).

Heavy-duty: All vehicles weighing more than 8,500 lbs. (such as cement trucks and school buses).

Vehicle Type*:* Use one of the followings:

Passenger car
Truck
Van
Bus

Type of Fuel Used: Use one of the followings:

Propane (LPG)
Natural Gas (CNG, LNG)
Ethanol
BioDiesel
Dual-fuel
Electricity
Ethanol
Methanol
Hybrid (Gasoline/electric hybrid)

Number of Vehicle: Provide the number of vehicles for this particular vehicle class and alternative fuel.

Day per Week Vehicle is Used: Provide the number of day(s) per a week the vehicle(s) operate(s).

Miles Traveled per Year: Provide an estimated number of miles the vehicle(s) travel per year.

If dual-fuel, specify % of time vehicle uses alternative fuels**:** Some vehicles are termed "dual-fuel," indicating that the vehicle can run either on conventional gasoline or a particular alternative fuel. If your organization has vehicles that have such capabilities, please specify an estimated percentage of time the vehicle is powered by alternative fuel. Use more than one line to report different percentages for different vehicles if necessary.

Estimated 2007 Total for this Vehicle Type: Provide an estimated number of AFVs for the year 2007 for each vehicle type used in your fleet. This number could be smaller or larger than the current vehicle number, as some vehicles may retire and more vehicles may be added to the fleet.

AACOG
Alamo Area Council Of Governments

2004 Alternative Fuel Vehicles Survey

Company/Organization:_____

Contact Person: _____Contact Person's Phone No._____

Vehicle Class	Vehicle Type	Type of Fuel Used	Number of Vehicle	Days per Week Vehicle is Used	Mile Traveled per Year	% of time dual-fuel vehicle uses alternative fuel	Estimated 2007 Total for this Vehicle Type

Combined Alternative Fuel Survey Results

The results of the 2001, 2003, and 2004 Alternative Fuel Survey can be found in the following tables. In the absence of survey data related to vehicle miles traveled (VMT), default VMT taken from the Dallas Fort Worth State Implementation Plan (SIP) were used. These VMT defaults are 36,000 miles/year for buses, and 10,000 miles/year for other vehicles. (TCEQ, 2000) A weighted average was calculated for the percentage of operation as an AFV, and a default of five days per week for the days per week of operation were used in the event that a response did not provide these values for a particular organization. Averages and defaults used in the modeling are denoted in bold.

Table K-1. Light Duty Vehicles Operating on Ethanol

Vehicle Class	Organization	% as AFV*	Days/ Week	VMT per Vehicle	2006/2007 Total
LDV	Bexar County	0%	6	677	73
LDV	U.T.S.A.	100%	5	5,000	2
Total Light Duty Ethanol Vehicles					75

* Denotes percentage of operating time the vehicles use alternative fuel.

Table K-2. Light Duty Vehicles Operating on Propane

Vehicle Class	Organization	% as AFV	Days/ Week	VMT per Vehicle	2006/2007 Total
LDV	TxDOT	75%	5	10,862	30
Total Light Duty Propane Vehicles					30

Table K-3. Light Duty Vehicles Operating on Electricity

Vehicle Class	Organization	% as AFV	Days/ Week	VMT per Vehicle	2006/2007 Total
LDV	UTSA	100%	5	1,500	39
Total Light Duty **Propane** Vehicles					39

Table K-4. Light Duty Trucks Operating on CNG

Vehicle Class	Organization	% as AFV	Days/ Week	VMT per Vehicle	2006/2007 Total
LDT	12 TS Randolph	0%	0	5,562	50
LDT	37 TS Lackland	0%	0	10,000	118
LDT	BexarMet Water	**29%**	5	10,000	34
LDT	CPS	100%	4	5,003	2
LDT	SA Parks	100%	7	10,000	22
LDT	USPS	0%	0	10,000	4
LDT	Yanaguana Cruise	100%	7	10,000	40
LDT	UTSA	50%	5	2,000	4
LDT	UTSA	50%	5	5,000	1
LDT	UTSA	50%	5	1,350	13
LDT	USPS	**29%**	5	10,000	80
Total LD CNG Trucks					368

Table K-5. Light Duty Trucks Operating on Propane

Vehicle Class	Organization	% as AFV	Days/ Week	VMT per Vehicle	2006/2007 Total
LDT	AmeriGas	100%	5	10,000	7
LDT	Beldon Roofing	**85%**	5	10,000	74
LDT	Bell Hydrogas	100%	5	10,000	16
LDT	Bexar County	50%	5	3,795	60
LDT	BexarMET Water	**85%**	5	10,000	6
LDT	City of San Antonio	50%	5	13,514	37
LDT	City of San Antonio	100%	5	13,514	198
LDT	Mission Gas	100%	5	10,000	14
LDT	Northside ISD	100%	5	10,000	8
LDT	SA Inter. Airport	100%	5	10,000	20
LDT	San Antonio Water System	14%	5	10,000	43
LDT	SA Trans	100%	7	10,000	18
LDT	Schwan's Enterprise	100%	5	10,000	25
LDT	Texas State Hospital	**85%**	**5**	10,000	52
LDT	VIA Transit	100%	6	32,019	184
LDT	Roberts Grain & Supply Inc,	98%	6	20,000	4
LDT	U. S. Dept. of Interior, National Park Service	100%	5	7,817	1
LDT	Thad Ziegler Glass Ltd.	100%	5	15,000	15
LDT	Bexar County	100%	5	177	27
LDT	Bexar County	**85%**	5	535	54
LDT	TxDot	84%	5	8,317	42
LDT	TxDot	80%	5	8,113	173
LDT	TxDot	77%	5	5,277	15
LDT	TxDot	76%	5	7,536	10
LDT	TxDot	76%	5	733	15
LDT	TxDot	76%	5	6,817	7
Total LD Propane Truck					1125

Table K-6. Light Duty Trucks Operating on Ethanol

Vehicle Class	Organization	% as AFV	Days/ Week	VMT per Vehicle	2006/2007 Total
LDT	12 TS Randolph	0%	7	5,562	1
LDT	CPS	0%	7	14,000	21
LDT	USAA	0%	7	10,000	100
LDT	USPS	0%	7	10,000	1
LDT	U.T.S.A.	100%	5	5,000	2
LDT	U.T.S.A.	100%	5	5,000	2
Total LD Ethanol Truck					127

Table K-7. Light Duty Trucks Operating on Electricity

Vehicle Class	Organization	% as AFV	Days/ Week	VMT per Vehicle	2006/2007 Total
LDT	37th TS Lackland	100%	5	10,000	2
LDT	USAA	100%	5	10,000	21
Total LD Electric Truck					23

Table K-8: Heavy Duty Vehicles Operating on Propane

Vehicle Class	Organization	% as AFV	Days/ Week	VMT per Vehicle	2006/2007 Total
HDT	Roberts Grain & Supply Inc,	100%	6	25,000	4
HDT	Smith Gas Co., Inc	100%	6	15,000	4
HDT	Bell Hydrogas	0%	5	20,000	13
HDT	TxDOT	91%	5	4,100	3
HDT	TxDOT	80%	5	Unknown	11
HDT	TxDOT	90%	5	Unknown	3
HDT	City of San Antonio	100%	5	9,551	51
Total HD Propane Vehicles					89

Table K-9: Heavy Duty Vehicles Operating on Compressed Natural Gas (CNG)

Vehicle Class	Organization	% as AFV	Days/ Week	VMT per Vehicle	2006/2007 Total
HDT	U.T.S.A.	50%	5	1,350	1
Total HD CNG Vehicles					1

Table K-10: Heavy Duty Vehicles Operating on Biodiesel

Vehicle Class	Organization	% as AFV	Days/ Week	VMT per Vehicle	2006/2007 Total
HDT	Bob White Express	0%	5	500	7
Total HD Biodiesel Vehicles					7

Table K-11. Heavy Duty School Buses Operating on Propane

Vehicle Class	Organization	% as AFV	Days/ Week	VMT per Vehicle	2006/2007 Total
BUS SCHOOL	Harlandale I.S.D.	100%	2	19,676	7
BUS SCHOOL	SouthWest I.S.D.	50%	5	18,000	24
BUS SCHOOL	NorthSide I.S.D.	100%	5	14,000	520
BUS TRANSIT	Alamo Regional Transit (ART)	30%	7	25,000	32
BUS TRANSIT	VIA Transit	100%	7	34,295	66
Total Buses Using Propane					649

AFV Emission Reduction Methodology

The combined results indicated that there are expected to be 2,533 AFVs by 2007. The AFVs operating solely on conventional gasoline or diesel were not included in the subsequent analysis, bringing the total number of vehicles modeled in the 2007 analysis down to 2,131 vehicles. Also, 14 of the Heavy Duty Vehicles operating on propane were removed from emission calculations because the vehicle miles traveled could not be determined.

Once the results of the alternative fuel survey were compiled, the estimated emission reductions resulting from the utilization of these vehicles were calculated. VOC and NOx emissions were calculated for each type of alternative fuel using the following formula:

Emissions Reductions (grams/yr.) for VOC and NOx = EM X VMT x %AF x EF
Where EM = Grams per mile emission
VMT = Total vehicle miles travel
%AF = Percentage of time the vehicle(s) uses Alternative Fuel
EF = Expected % of reduction per Alternative Fuel

Table K-12 outlines the expected emission reductions of ozone precursors through the use of each selected alternative fuel.

Table K-12. Expected Emission Reductions from the Use of Selected Alternative Fuels

Pollutant	LPG % Reduction[1]	CNG % Reduction[2]	B20 % Reduction[3]	Ethanol (E85) % Reduction[4]	Electricity[5]
Hydrocarbons	33.0%	45.0%	11.0%	30.0%	100.0%
NOx	20.0%	34.0%	-1.2%	35.0%	100.0%

[1] Pacific Northwest Pollution Prevention Resource Center, May 1999. Topical Reports: Alternative fuels for Fleet Vehicles. Available online: http://www.pprc.org/pprc/pubs/topics/altfuels.html
[2] Maryland Energy Administration, no date. Chesapeake Bay Alternative Fuel Vehicle Source Book. Annapolis, MD. Referenced also; page 7: v
[3] National Renewable Energy Laboratory, September 2001. Biodiesel – Clean, Green Diesel Fuel. U.S. Department of Energy. (Online) Available: http://www.afdc.doe.gov/pdfs/Bio_CleanGreen.pdf
[4] Renewable Fuels Association, February 2001. Ethanol: Industry Outlook 2001. Washington D.C.
[5] Electric Vehicles do not emit ozone precursor pollutants

In the absence of survey data related to vehicle miles traveled (VMT), default VMT taken from the Dallas Fort Worth State Implementation Plan (SIP) were used. These VMT defaults are 36,000 miles/year for buses, and 10,000 miles/year for other vehicles. (TCEQ, 2000) A weighted average was calculated for the percentage of operation as an AFV, and a default of five days per week for the days per week of operation were used in the event that a response did not provide these values for a particular organization. An example of the weighted average calculation for light-duty CNG fueled vehicles is provided below.

The survey results indicated that 64 of the reported CNG vehicles were operating 100% of the time on CNG, 18 CNG vehicles were operating 50% of the time on CNG, and 172 CNG vehicles were operating 0% of the time on CNG. The weighted average was calculated to be 29% for CNG vehicles through the use of the following formula and subsequent calculation:

$$\frac{(\#\text{ of AFVs} \times \%\text{ of operation as AFV}) + (\#\text{ of AFVs} \times \%\text{ of operation as AFV})}{\text{Total number of vehicles}}$$

[(64 x 100%) + (18 x 50%) + (172 x 0%)] / (64+52+172) = a weighted average of 29%

The resulting emission reductions from each of the 11 groups of vehicles were summed to obtain an emission reduction estimate for the entire fleet.

For the projected 2007 fleet it was assumed that the current fleet sizes were maintained at the current level unless otherwise noted. In addition, any projected increases in fleet sizes for 2006 in the selected survey, were assumed to carry over into 2007. The projected 2007 AFV fleet size makes up only a very small percentage of all of the on-road vehicles within the region. If the AFV fleet size were to increase significantly, sizeable emission reductions should result.

While these estimated reductions are not overly sizeable, they do illustrate that a switch to alternative fuel vehicles will result in the reduction of ozone precursors in addition to reducing our nation's dependence on foreign oil. As alternative fuel technology advances, refueling infrastructure expands, and the use of alternative fuels becomes more acceptable, the emissions reductions resulting from the utilization of an AFV fleet in the SA MSA should become more significant.

Transportation Demand Management

Introduction

TDMs are transportation projects and related activities that are designed to achieve on-road mobile source emission reductions and are included as control measures in the SIP. These measures target the users (demand) of transportation facilities (supply) rather than the facilities.

Successful implementation of TDMs can contribute to the reduction in frequency of traffic congestion, and by smoothing the traffic flow they can particularly reduce emission of VOCs and CO2, which occur at lower traveling speed.

The following pages contain materials that AACOG staff has used for conducting two local surveys on use of TDMs in 2001 and 2004. The 2001 survey database was used to supplement the 2004 survey. The overall impacts of TDMs on reduction of ozone precursors are also discussed at the end of this section.

Cover Letter & Alternative Work Schedule Survey Questionnaire:

April 22, 2004

Name
Mailing address

Dear :

As part of our on-going efforts in regards to the San Antonio region air quality planning, the Alamo Area Council of Governments (AACOG) is conducting this survey to collect information on employees flexible work schedule, and ride sharing programs. Employers practice these programs in order to mitigate air pollution and traffic congestion during the weekday rush hours, also to make more efficient use of our transportation resources. We would like to include the information about your organization's programs in our study.

The elected officials in the San Antonio region have made a commitment to promote locally favorable air quality control strategies to keep San Antonio's air quality within the national standards. The information that you give us will be used to determine the effectiveness of such air quality control strategies in reducing and controlling emission of air pollutants in the region. Your input is very vital to the success of our efforts.

Please take a moment and provide your responses on the attached questionnaire and return it by the indicated date.

Thank you for your time and participation. If you have any questions or comments please contact Parviz Nazem of our technical staff, at (210) 362-5317.

Regionally yours,

Al J. Notzon III
Executive Director

Enclosure: Questionnaire

AACOG
Alamo Area Council Of Governments

Transportation Demand Management (TDM) Survey

Company/Organization: _____
Contact Person: _____Contact Person's Phone No._____

The purpose of this survey is to collect information on the use of TDM programs by employees in the San Antonio area. These programs are designed to make more efficient use of transportation resources, and they result in environmental and social benefits. The following lines inquire information on these programs, in which your company/organization might be participating. Please respond by May 20, 2004.

1: *Alternative Work Schedule Programs*

Does your company participate in any alternative work schedule program? Yes ☐ No ☐

If **yes**, please answer the following:

- ☐ Compressed Week - 9 work days in two work weeks # of Employees _____
- ☐ Compressed Week – 4 work days in one work week # of Employees _____
- ☐ Staggered Hours – various start and end time (ex. 9-6, 12-8) # of Employees _____
- ☐ Flex-Time # of Employees _____
- ☐ Telecommuting – performs work at home # of Employees _____

  If so, estimate average number of hours per a week worked at home. _____

Is there any future expansion plan for current alternative work schedule? Yes ☐ No ☐
How many more employees do you anticipate to participate in the future and in which program?
……
……

2: *Ridesharing*

Does your company participate in a vanpool program? Yes ☐ No ☐

If **yes**, how many employees participate? _____

How many vans are currently used for the program? _____

Does your company participate in a carpool program? Yes ☐ No ☐

If **yes**, how many employees participate? _____

How many cars are currently used for the program? _____

Thank you.

2007 TDM Forecast Statistics Based on 2001 and 2004 Surveys

Table K-13. 2007 Total Employee Participation per Program

Company	Cww9[6]	Cww4[7]	CWW3[8]	Staggered Hours	Flex Time	Telecommute
City of Hill Country Village	0	10	0	0	0	0
City of Leon Valley **	19	0	0	15	0	0
Dean Word Co. Ltd.	0	0	0	90	0	0
Goodwill Industries	0	0	0	5	0	0
Health South RIOSA *	4	0	0	0	0	0
Mission Road Development Center	0	0	0	79	5	2
Oberthur Gaming Tech.	0	0	12	0	0	0
San Antonio - Bexar County MPO	0	0	0	8	0	0
San Antonio Express-News	0	25	0	0	0	12
Science Applications International Corp (SAIC)	0	0	0	25	0	6
State Bank & Trust of Seguin, Texas	0	0	0	10	0	0
Town of Hollywood Park	0	0	0	1	0	0
WellMed at Greenway Park	7	0	0	5	0	1
City of China Grove	0	0	0	0	2	0
City of Castle Hills	0	2	0	0	0	0
LeadingEdge Personnel	0	0	0	25	0	0
John B. Sanfilippo & Son	0	0	0	285	0	0
YMCA of San Antonio & the Hill Country	0	0	0	650	0	0
Comal ISD (Summer Only)	0	800	0	0	0	0
Northside ISD	0	0	0	9500	0	0
Texas Department of Human Services	300	200	0	100	0	35
Southwest Texas State University	0	0	0	0	7	7.5
Education Service Center, Region 20	0	0	0	75	0	0
Focus Direct, Inc.	0	32	0	52	7	0
Wallace L. Boldt, General Construction, Inc.	0	0	0	20	0	0
Southwest Mental Health Center	0	0	0	0	25	0

[6] Compressed Work Week 9/80 program.
[7] Compressed Work Week, 4 days of work program.
[8] The survey form did not include questions about this 3-day workweek program, yet some agencies reported such program.

Company	Cww9[6]	Cww4[7]	CWW3[8]	Staggered Hours	Flex Time	Telecommute
VNA & Hospice	0	0	0	7.5	0	1
Sterling Metal Products	0	0	0	6	0	0
Harlandale ISD (Maintenance Department)	0	0	0	200	200	0
LaVernia ISD (Summer Only)	0	23	0	0	0	0
Schertz-Cibolo-Universal City ISD	0	10	0	10	0	0
Valero Energy Corporation	1127	0	0	0	0	0
Bexar County	42	42	0	210	210	42
San Antonio Missions National Historical Park	0	2	0	52	0	0
37 SPTG, Lackland Air Force Base	0	0	0	4000	2500	0
City of Alamo Heights	0	0	0	0	4.5	0
Randolph Air Force Base	219	5	0	0	406	0
Southwest Independent School District	0	0	0	829	0	0
Audie L. Murphy Veterans Administration	117	50	0	885	0	13
U.S.A.A.	0	6940	0	0	0	727
Dee Howard Aircraft Maintenance, L.P.	0	0	0	298	0	0
San Antonio Independent School District	0	8	0	74	0	0
U.S. Army Garrison, FSH, TX.	1250	275	0	0	600	0
Zachry Construction Corporation	0	20	0	0	20	15
Morningside Ministries	0	0	0	0	0	3.5
311 Human Systems Wing-Brooks AFB, TX	1	0	0	0	0	0
Bexar Electric	0	0	0	50	50	0
Marion ISD	0	45	0	0	0	0
Standard Aero (San Antonio Inc.)	647	56	25	0	0	0
Guadalupe Valley Hospital	20	15	0	40	0	8
SW Found. for BioMedical Research	0	0	0	0	200	0
Pratt & Whitney San Antonio Item Repair	0	10	0	5	20	0
San Antonio Federal Credit Union	0	4	0	0	15	0
Randolph-Brooks Fed. C U	0	0	0	25	0	0

Company	Cww9[6]	Cww4[7]	CWW3[8]	Staggered Hours	Flex Time	Telecommute
Broadway Bank	0	7.5	0	0	0	0
R&L Foods, Inc	0	0	0	28	0	0
Hilton Palacio Del Rio	0	0	0	20	50	0
San Antonio Housing Authority	0	0	0	0	0	8
Nix Health Care System	0	150	0	0	0	0
San Antonio State School	0	0	0	400	0	0
Tobin International	27	2	0	36	6	0
Our Lady of the Lake University	350	0	0	0	350	0
City of San Antonio Fire Department	0	5	0	15	1	0
South Texas Blood & Tissue Center	0	10	0	238	0	0
McCombs Enterprises	0	0	0	0	50	0
San Antonio State Hospital	0	9	0	0	0	0
Palo Alto College	0	300	0	0	0	0
Unknown	0	0	0	65	0	0
City Public Service	250	100	0	500	0	20
VIA Metropolitan Transit Authority	0	84	0	940	345	0
Unknown	0	0	0	65	0	0
St. Mary's University	0	0	0	40	0	0
Edgewood ISD		57		135	23	
Alamo Cement				70	0	
Center for Health Care Sup				25	25	
Gentiva Heath sertvices	0	0	0	0	70	0
Eden House, Inc.	0	0	0	12	6	0
Harlandale ISD	0	0	0	0	20	0
San Antonio Water System	73	564	0	1013	73	0
Vehicular Testing Services LLC	0	80	0	15	0	0
Texas Department of Transportation	0	0	0	6	208	0
TX Dept. of Humans Svcs.	0	86	0	0	0	0
Methodist Healthcare Sys	0	1328	0	0	0	24
Education Service Center, Region 20	0	0	0	8	0	0
CCC Group Inc.	0	0	0	0	5	0
TRDI, Inc.	0	0	0	0	0	0

Company	Cww9[6]	Cww4[7]	CWW3[8]	Staggered Hours	Flex Time	Telecommute
City of San Antonio	88	1356	0	2117	189	39
Kelly Aviation Center, LP	505	0	0	0	0	0
Total	**5046**	**12712**	**37**	**23241.5**	**5677.5**	**917**

2007 Total Employee Participation	47771
2004 Total Vanpool Participation	683
2004 Total Participating Companies	87
Average # of Days/week telecommuting	2.33
Average # of people per vanpool	7.94

TDM Emission Reduction Methodologies

The transportation demand management (TDMs) discussed in this summary are programs implemented within the San Antonio metropolitan area to reduce vehicle miles traveled (VMT) and shift peak hours traffic to off-peak hours. The collected data allowed us to evaluate the current TDM participation rates and understand the future status of TDM programs for companies and governmental agencies with employment population greater than 200 employees. The TDMs used in this study included: Vanpool, Carpool, Telecommuting, Flex Time, Compressed Work Week, and Staggered Hours. All of these programs are voluntary and are offered at either the employer or employee level.

The first step in conducting the study involved mailed out of a survey to various organizations and establishments within the 4-county San Antonio metropolitan area. An address database maintained by the San Antonio Chamber of Commerce was used to determine the number of employers with 200+ employees for the year 2004. Combining the useable responses from the 2001 survey with the 2004 survey resulted in a database with 88 records. Information from the 2000 U. S. Census on modes of commuting to work and the average Home-Based-Work trip length for workers 16 years old and over were also collected. The results were then entered into the COMMUTER model to calculate the emissions and VMT reductions based on the pertinent data such as: work trip length, vehicle occupancy, length of peak period, peak and off-peak speeds, office and non-office employee population, 2007 MOBILE5 generated emission factors, and VMT mix by vehicle type.

The survey conducted on TDM participation showed that Staggered Hours was the most widely used TDM in this region, followed by Compressed Work Weeks, Flex Time, and Telecommuting. Overall, based on this 2004 survey and other local input data, these TDMs are expected to reduce VOC's by 60 pounds per day; the NOx emissions will be reduced by 52 pounds per day.

The following table represents the final output generated by the COMMUTER model. As it was expected, the amounts of pollutants during the am peak (7:15 am to 8:15 am) and pm peak hours (4:45 pm to 5:45 pm) are decreased while the off peak hours show increased levels of pollutants. The total reductions by specific pollutant, which in

essence are the differences between the amounts of peak hour's losses and off-peak hours gains are also shown in this table.

2007 Emission Reduction due to Implementation of TDMs in San Antonio Area
(positive values are decreases)

Pollutant	**Peak** tons/day	**Off-peak** tons/day	**Total Reduction** tons/day	**Total Reduction Lbs./day**
VOC	0.077	-0.047	0.030	60
CO	0.715	-0.408	0.308	616
NOx	0.091	-0.065	0.026	52

Voluntary Air Quality Control Strategies

An integral part of air quality planning for the San Antonio EAC Region is the involvement of area leaders in business and industry, local school district officials, and other agencies in the adoption of voluntary measures. As part of the Clean Air Plan, AACOG compiled a special list of participating businesses and agencies within the area that have begun to adopt voluntary measures which will help clean the air. Responding companies and agencies categorized their actions as “Commitment Measures” or “Voluntary Measures” for incorporation into the plan.

> Commitment Measures - These commitments are provided to the Texas Commission on Environmental Quality (TCEQ) and the US Environmental Protection Agency (EPA) as part of the Clean Air Plan and the State Implementation Plan (SIP). The commitments are evidence of an ongoing commitment by local leaders in support of clean air policy.
>
> Voluntary Measures - These commitments will be done on a voluntary basis to minimize emissions to the best of a company's ability.

It is important to understand that the following commitments were obtained from the agencies, and authorized by signature. The authorization consent form signed contains the following specific language, followed by the signature block:

> Authorization - I authorize the Air Improvement Resources Committee to include our actions and commitments, as described and classified above (referring to the "Commitment" and "Voluntary" definitions above), in the Clean Air Plan that will be submitted to EPA and TCEQ. I understand that copies of our letters describing our commitment may be included in the Clean Air Plan.

A copy of one of the signed commitment letters (from the San Antonio Water System) is attached to the end of this appendix as an example of this process and the form mailed out to each agency.

The following pages contain strategy descriptions of companies, agencies, and school districts that have volunteered to practice these air-cleaning strategies.

Bexar County

Commitment Measures: Commitment letter signed by Renee D. Greene, P.E. – Director of Environmental Service, Bexar County, February 4, 2004

Converted eighty percent of its eligible fleet to propane.
Alternative fuels with low Reid Vapor Pressure (RVP) are purchased for gasoline powered vehicles.
Providing bus pass subsidies to all employees
A public outreach program has been developed and information is posted on the county’s website.
On Air Quality Health Alert Days, the county suspends activities such as refueling, paving, mowing and painting. Air Quality Health Alert flags are flown at all county offices.
Low RVP gasoline is used in all Bexar County sheriff patrol vehicles. The County continues to replace fleet vehicles with low emission vehicles (LEV).
Texas Ultra Low Sulfur Diesel Fuel is used in Bexar County diesel fleet vehicles.

Voluntary Measures
Encourage employees to use general energy conservation measures (i.e., turn off lights and equipment when they are not in use, at home and at work.
Maintain fleet vehicles and buses according to manufacturer's tune-up and emissions control standard.
Post signs at facilities promoting ozone reduction measures.
Commit to using cleaner burning fuel
Achieve code compliance in the International Energy Conservation Code (IECC).

City of Converse
Commitment Measures: Commitment letter signed by Sam Hughes – City Manager, City of Converse, March 16, 2004
Encourage employees to use general energy conservation measures (i.e., turn off lights and equipment to reduce power load when not in use, both at work and home).
Maintain fleet vehicles and buses according to manufacturer's tune-up and emissions standards.
Refuel fleet vehicles and buses carefully and in the cooler evening hours during an AQHA.
Instruct employees and fleet drivers to practice efficient driving such as avoiding excessive idling, minimizing cold starts by combining trips, avoiding jackrabbit acceleration, and driving 55 mph maximum.

Voluntary Measures
Give incentives to those employees who are participating in a carpool or vanpool.
Encourage employees to bring lunch to work or walk to avoid car travel during lunchtime.

City of Leon Valley
Commitment Measures: Commitment letter signed by the Honorable Marcy Meffert, Mayor of the City of Leon Valley, March 11, 2004
Encourage employees to use general energy conservation measures (i.e., turn off all lights and equipment to reduce power load, both at work and home).
Maintain all 55 fleet vehicles and buses according to manufacturer's tune-up and emissions control standards.
Refuel all fleet vehicles and buses during cooler evening hours during an AQHA.
Will limit the use of oil-based paints, varnishes and degreasers to days that are not AQHA days.
Instruct all employees and fleet drivers to practice efficient driving, such as avoiding excessive idling, minimizing cold starts by combining trips, avoiding jackrabbit acceleration and driving 55mph maximum.
Post signs at facilities promoting ozone reduction measures at 3 city-owned locations.
Achieve code compliance in the International Energy Conservation Code (IECC).

Voluntary Measures
Consider alternative fuels for vehicle fleets (10 or more vehicles per fleet).
Participate in voluntary vehicle emissions testing and maintenance programs.
Encourage approximately 30% of city employees to bring a lunch or walk to avoid car travel during lunchtime.
Commit to using cleaner burning fuel when financially feasible.

City of San Antonio (COSA)

Commitment Measures: Commitment letter (subject to further City Council action) signed by David E. Newman – Environmental Services Manager, City of San Antonio, March 5, 2004

Allow flextime or telecommuting for approximately 3000 city employees.
Maintain fleet vehicles according to manufacturers tune-up and emission control standard. The City performs inspection/maintenance on approximately 3000 city fleet vehicles.
Consider alternative fuels for small vehicle fleets. Approximately 900 city fleet vehicles are currently alternative fuel vehicles.
Post signs at facilities promoting ozone reduction measures for 12,000 city employees.
Commit to using cleaner burning fuel.
Delay construction operations, such as pothole repair, street striping, and mowing activities, to days that are not Air Quality Health Alert days.
Stage II VRS are in place on gasoline dispenser pumps at four service centers and police/fire substations.
Use thermoplastics for highway markings
COSA's Landscape and Tree Preservation Ordinance attempts to preserve existing trees, encourage the planting of new trees, and encourage responsible development.
Prohibit use of approximately 20 motorpool vehicles on AQHA days.

Voluntary Strategies

Requested and obtained a lower RVP level for all gasoline shipped into the San Antonio metropolitan region for the ozone season of 1999.
Stage I Vapor Recovery Systems (VRS) are in place on UST's at all city fueling facilities.
The Purchasing Department implements a modified I/M program using a four-gas emission analyzer. All vehicles are tested by the I/M Program during the annual safety inspection.
To encourage employee bus ridership, the City has a bus pass subsidy program for its employees. The City offers approximately 1500 bus pass subsidies at $5 off.
Synchronization of stoplights by COSA.
Public Outreach Participation.
Sponsorship of Public Vehicles Emissions Testing & Media Events.
Creation of a COSA-wide Air Quality Health Alert Program.
Creation of Intelligent Transportation System (TransGuide).
Encourage approximately 12,000 employees to use general energy conservation measures (ie. Turn off lights and equipment to reduce power load when not in use, both at work and home).
Instruct employees and fleet drivers to practice efficient driving such as avoiding excessive idling, minimizing cold starts by combining trips, avoiding jackrabbit acceleration, and driving 55 mph maximum.
Successfully apply for emissions reductions grants available through theTexas Emission Reduction Program (TERP).
Expedited permitting for mixed use, transit oriented or in-fill development
Use low VOC striping material.
Open burning restrictions.
Renewable energy program.
Low emission vehicles.
Offer direct deposit to employees.
Fuel city-owned vehicles during the cooler, evening hours.
Promote limiting the idling of city-owned vehicles.
Transit-Oriented Development.

Encourage approximately 12,000 employees to carpool by giving incentives for carpooling activities.
Encourage approximately 12,000 employees to bring a lunch or walk to avoid car travel during lunchtime.
Achieve code compliance in the International Energy Conservation Code (IECC).
Limit use of oil-based paints, varnishes, and degreasers in the city's sign shop during an AQHA.

City of Stockdale
Voluntary Measures: Letter signed by the Honorable Tony Malik, Mayor of the City of Stockdale, February 20, 2004
Encourage employees to use general energy conservation measures (i.e., turn off all lights and equipment to reduce power load, both at work and home).
Maintain fleet vehicles according to manufacturer's tune-up and emissions control standards.
Post signs at facilities promoting ozone reduction measures.
Refuel fleet vehicles carefully and in the cooler evening hours during an AQHA.
Will limit the use of oil-based paints, varnishes and degreasers to days that are not AQHA days.
Instruct employees to practice efficient driving, such as avoiding excessive idling, minimizing cold starts by combining trips, avoiding jackrabbit acceleration and driving 55mph maximum.

City Public Service (CPS)
Commitment Measures: Commitment letter signed by Joe Fulton – Director, Research and Environmental Management, City Public Service, March 19, 2004
Renewable Energy Program – Windtricity program launched in April 2000
Emission Reduction Program
CPS has reduced NOx at gas and coal units to 50% of 1997 levels and will "net out" of NOx emissions when the new coal unit is scheduled to come on line in 2009.
CPS' program includes combustion tuning and installation of advanced technology.
CPS has state and federal air permits for all gas and coal units.
New combined cycle gas turbine and simple cycle gas turbines have add-on NOx controls.
New coal unit will have BACT controls of NOx, sulfur dioxide and particulate matter.
An additional monitoring station will be operated on the southeast side of San Antonio monitoring NOx, SO2, CO, PM-10 and PM 2.5. This will be in addition to the current operating station. Also, four PM-10 monitors will be located on all four sides of the coal plant property.
Two compressed natural gas (CNG) trucks are operated and a CNG station is used to fuel the vehicles.
Fleet Vehicle Emission Reductions
CPS uses ethanol (E-85) in approximately 136 flex-fueled vehicles.
Two hybrid vehicles (Super Ultra Low Emission Vehicles) purchased
Two compressed natural gas (CNG) trucks used.
Night fueling service – approximately 300 fleet vehicles or equipment are fueled at night
Vehicles periodically checked with 2-gas analyzer and opacity meter.
Texas Emissions Reduction Program (TERP) grant successfully obtained for diesel engine bulldozer
Purchase of five propane forklifts

Removal of older vehicles and equipment that have been replaced by vehicles and equipment that meet today's more stringent emissions standards.

Voluntary Measures
Give incentives to CPS employees that are interested and participating in a carpool.
Give incentives to CPS employees that are interested and use buses for their daily trip to work.
Encourage approximately 2500 CPS employees to bring a lunch or walk to avoid car travel during lunchtime via email notices.
All flextime or telecommuting for CPS employees for which this option is feasible and allowed by the management of that area.
Encourage approximately 2500 CPS employees to use general energy conservation measures (i.e., turn off lights and equipment when they are not in use, at home and at work.)
Maintain CPS fleet vehicles according to manufacturer's tune-up and emissions control standard.
Instruct approximately 2500 CPS employees and fleet drivers to practice efficient driving, such as, avoiding excessive idling, minimizing cold starts by combining trips, avoiding jackrabbit acceleration, driving 55 mph maximum.
Limit use of oil-based paints, varnishes, and degreasers during an AQHA.

Fort Sam Houston Independent School District
Commitment Measures: Commitment Letter signed by Gail E. Siller – Superintendent, Fort Sam Houston ISD, February 25, 2004
Instruct employees and fleet drivers to practice efficient driving such as avoiding excessive idling, minimizing cold starts by combining trips, avoiding jackrabbit acceleration and driving 55 mph maximum.
Encourage 225 district employees to use general energy conservation measures (i.e., turn off lights and equipment when they are not in use, at home and at work).
Maintain 10 district buses according to manufacturer's tune-up and emissions control standard.
Will not mow the lawn or use gas powered lawn equipment during an AQHA on the two district campuses.

Guadalupe County
Voluntary Measures: Letter signed by Stan Burrier – County Engineer, Guadalupe County, March 17, 2004
Employees are encouraged to participate in voluntary programs, such as carpooling whenever possible.
Encourage employees to bring a lunch of walk to avoid car travel during lunchtime.
Encourage employees to use general energy conservation measures (i.e., turn off lights and equipment when they are not in use, at home and at work).
Maintain fleet vehicles and buses according to manufacturer's tune-up and emissions control standard.
Instruct employees and fleet drivers to practice efficient driving, such a, avoiding excessive idling, minimizing cold starts by combining trips, avoiding jackrabbit acceleration, driving 55 mph maximum.

Harlandale ISD
Commitment Measures: Commitment letter signed by Henry Galindo - Director of Transportation and Maintenance Support, Harlandale ISD, February 10, 2004

Uses nine alternative fuel buses and will continue to consider alternative fuels for all vehicle purchases.
Maintain 150 maintenance vehicles and 59 buses according to manufacturer's tune-up and emissions control standard.
Consider alternative fuels for vehicle fleets (10 or more vehicles per fleet).
Will not mow lawns or use gas powered lawn equipment during an AQHA at all 25 district facilities.
Will limit the use of oil-based paints, varnishes, and degreasers to days that are not designated as AQHA days at all 25 district facilities.
Instruct employees and fleet drivers to practice efficient driving, such as, avoiding excessive idling, minimizing cold starts by combining trips, avoiding jackrabbit acceleration, driving 55 mph maximum.

Voluntary Measures
Encourage all 2,100 employees to use general energy conservation measures (i.e., turn off lights and equipment when they are not in use to reduce power load, both at home and at work).

Lackland Independent School District
Commitment Measures: Commitment letter signed by David F. Splitek – Superintendent, Lackland ISD, February 9, 2004
Encourage employees to use general energy conservation measures (i.e., turn off lights and equipment to reduce power load when not in use, both at work and home).
Maintain fleet vehicles and buses according to manufacturer's tune-up and emissions control standard.
Will not use oil-based paints, varnishes or degreasers on days that are AQHA's.
Encourage employees to bring lunch to work or walk to lunch to avoid car travel during lunchtime.
Instruct employees and fleet drivers to practice efficient driving such as avoiding excessive idling, minimizing cold starts by combining trips, avoiding jackrabbit acceleration and driving 55 mph maximum.
Post signs at facilities promoting ozone reduction measures
Investigate the possibility in applying for emission reduction grants through the Texas Emissions Reductions Plan (TERP).
Will comply to a feasible extent the delay of construction operations (using gasoline or diesel equipment) to days that are not Air Quality Health Alert days.
During an AQHA, fleet vehicles and buses will be refueled in the cooler evening hours when possible.
Gas powered lawn equipment will not be used during an AQHA. Rather, grounds personnel will be assigned alternative tasks.

Voluntary Measures
Consider alternative fuels for vehicle fleets (10 or more vehicles per fleet).
Participate in voluntary vehicle emissions testing and maintenance programs.
Give incentives to those employees who are participating in a carpool
Give incentives to those employees who use buses for their daily trip to work
Check availability of fuel stations that dispense cleaner burning fuel.
Will explore International Energy Conservation Code (IECC) compliance.

Our Lady of the Lake University

Voluntary Measures: Letter signed by Darrell Glasscock – Director of Physical Plant, Our Lady of the Lake University, February 13, 2004

Encourage employees to use general energy conservation measures (i.e., turn off lights and equipment to reduce power load when not in use, both at work and home).
Maintain fleet vehicles and buses according to manufacturer's tune-up and emissions standards.
Post signs at facilities promoting ozone reduction measures.
On Air Quality Health Alert Days, the University will not mow the lawn or use gas powered lawn equipment.

Randolph Air Force Base

Commitment Measures: Commitment letter signed by Colonel Mark W. Graper – USAF, Commander, 12th Flying Training Wing, February 25, 2004

Converted from higher volatility fuel (JP-4) to a more environmentally friendly JP-8 fuel.
Encourage RAFB populace of 17,000 to use general energy conservation measures (ie. Turn off lights and equipment to reduce power load when not in use, both at work and home).
Consider alternative fuels for vehicle fleets. Currently, over 60 vehicles have been converted to alternative fuel capability.
Post signs at facilities promoting ozone reduction measures.
Encourage RAFB populace of over 17,000 people to bring a lunch or walk to avoid car travel during lunchtime.
Maintain approximately 280 fleet vehicles and buses according to manufacturer's tune-up and emissions control standard.
Instruct the base populace of over 17,000 people to practice efficient driving, such as avoiding excessive idling, minimizing cold starts by combining trips, avoiding jackrabbit acceleration, driving 55 mph maximum.

Voluntary Measures

Elevated research on development of sources for fuel alternatives. Review new technologies to ensure that they comply and that law does not hinder the use of new technologies.
During AQHA days, refuel fleet vehicles and buses carefully and in cooler evening hours and on days that are not AQHA days.
On AQHA days, will not use oil-based paints, varnishes, or degreasers on days that are AQHA's.

San Antonio / Bexar County Metropolitan Planning Organization

Commitment Measures: Commitment letter signed by Jeanne Geiger – Deputy Director, San Antonio-Bexar County MPO, March 9, 2004

Provides funding for the Rideshare Program
Participating in an ongoing public outreach program that encourages commuters to consider alternatives to driving alone.
Allow employees to use flex time program to encourage travel outside of the peak periods. Eight of eight employees use this program.
The MPO flies the AQHA flag on appropriate days to help create awareness of the AQ situation.

Voluntary Measures

Encourage employees to bring lunch or walk and/or carpool to lunch to reduce cold starts and emissions.
Encourage employees to use general energy conservation measures (i.e., turn off lights and equipment when they are not in use at home and at work.)
Instruct employees to practice efficient driving, such as avoiding excessive idling, minimizing cold starts by combining trips, avoiding jackrabbit acceleration, driving 55 mph maximum.

San Antonio Water System
Commitment Measures: Commitment letter signed by Eugene E. Habiger – President/Chief Executive Officer, San Antonio Water Systems, March 2, 2004
SAWS has an internal Air Quality Committee that meets as needed to update or address air quality issues that affect SAWS operations.
Once a year SAWS distributes information to 280,000 customers, encouraging them to practice emission reduction measures during the ozone season.
Encourage employees to use general energy conservation measures.
At SAWS, demand side management is practiced.
A lighting erplancement program to high efficiency T8 lighting with electronic ballasts is in place at the SAWS Service Centers and will be implemented at all other SAWS owned facilties.
An energy database is being created to determine pump efficiencies.
Building heating and cooling leaks will be determined using thermal imaging, as well as, preventative maintenance for pumps by setting thermal baselines.
Evaluating all existing HVAC systems.
Evaluating new roofing.
Central Heating & Cooling retrofits.
Maintain fleet vehicles according to manufacturer's tune-up and emissions control standards.
Considers alternative fuels for vehicle fleets.
Have 5 propane trucks and 5 propane forklifts.
Have 69 bi-fuel (unlead/propane) vehicles and 4 electric forklifts.
Working with AACOG, Ford, and CleanFuels on a LPG Fueling Station at the new Northwest Service Center.
Looking into testing hydrogen fuel cell powered vehicles.
Continue to post AQHA signs at SAWS facilities when an AQHA is issued.
Flags and signs will be posted at the following Water Recycling Centers: Dos Rios, Leon Creek, Salado Creek, and Medio Creek.
Flags and signs will be posted on the following Service Centers: Eastside, Mission Road, Northeast, Northwest, and Van Dyke.
Will institute contract language to preclude mowing lawns or using gas-powered lawn equipment during an AQHA.
Encourage employees to bring lunch to work to avoid car travel during lunchtime.
Instruct employees and fleet drivers to practice efficient driving, such as avoiding excessive idling, minimizing cold starts by combining trips, avoiding jackrabbit acceleration.
Stage I and II Vapor Recovery Systems at fleet fuel sites. Fleet fuel sites:
Dos Rios
Eastside Service Center
Northeast Service Center
Northwest Service Center
Mission Road

Van Dyken
SAWS is currently complying with SECO reporting requirements in achieving code compliance in the International Energy Conservation Code (IECC).
Once a year, SAWS distributes information to approximately 340,000 accounts about encouraging them to practice emission reduction measures during the ozone season.

Voluntary Measures
Allows flextime, compressed workweek, and / or telecommuting for employees.
To encourage bus ridership, SAWS has a bus pass subsidy program for its employees.
Consider posting signs and flags at SAWS facilities promoting ozone reduction measures.
The Kelly Service Center is considering posting a flag and sign.
The following Heating & Cooling Facilities are considering posting flags and signs: Central, Alamodome, Brooks, and Kelly.
Commit to using cleaner burning fuel.
Successfully apply for emissions reductions grants available through the TeXas Emissions Reductions Plan (TERP).
Refuel fleet vehicles in the cooler evening hours during an AQHA.
Limit use of oil-based paints, varnishes, and degreasers during an AQHA in parts-washers procedures.

Seguin Independent School District
Commitment Measures: Commitment document signed by Rene Ramos, Chief Operations Officer, Seguin ISD, February 13, 2004
The district does not use oil-based paints.
A district-wide energy conservation program has been implemented. Energy conservation measures are included in district procedure manual.
Maintain fleet vehicles (26) and buses (54) according to manufacturer's tune-up and emissions control standards.
Encourage employees (1,068) to use general energy conservation measures (i.e., turn off lights and equipment to reduce power load when not in use, both at work and home).
Post signs at facilities promoting ozone reduction measures.
Do not mow lawns or use gas-powered lawn equipment during an AQHA. Grounds personnel will be given alternative duties.
Refuel district's 26 maintenance vehicles and 54 buses during cooler evening hours during an AQHA.
Limit use of oil-based paints, varnishes and degreasers to days that are not designated AQHA days. Painters will be instructed on measures during an AQHA.
Instruct employees and fleet drivers to practice efficient driving, such as avoiding excessive idling, minimizing cold starts by combining trips, avoiding jackrabbit acceleration, driving 55 mph maximum during employee training sessions.
Post signs at facilities promoting ozone reduction measures in a district-wide email forum.

Voluntary Measures
Encourage employees to bring lunch to work or walk to lunch to avoid car travel during lunchtime by providing a break area and opportunities to by lunch in office.

South San Antonio ISD

Commitment Measures: Commitment letter signed by Ruben G. Flores – Administrator, South San Antonio ISD, February 26, 2004

Encourage employees to use general energy conservation measures (i.e., turn off lights and equipment to reduce power load when not in use, both at home and work) during staff/faculty meetings.

Maintain fleet vehicles and buses according to manufacturer's tune-up and emission control standard.

Participate in voluntary vehicle emissions testing and maintenance programs.

Refuel fleet vehicles and buses carefully and in the cooler evening hours during an AQHA.

All maintenance personnel will be informed about limiting use of oil-based paints, varnishes, and degreasers to days that are not AQHA days.

Encourage employees to bring lunch or walk to avoid car travel during lunchtime.

Instruct employees and fleet drivers to practice efficient driving such as avoiding excessive idling, minimizing cold starts by combining trips, avoiding jackrabbit acceleration and driving 55mph, maximum.

Post signs at facilities promoting ozone reduction measures at district schools and administrative offices.

All maintenance personnel will be informed to not mow lawns or use gas powered lawn equipment during an AQHA.

Voluntary Measures

South San Antonio ISD will research and evaluate the consideration of alternative fuels for district vehicle fleet.

Texas Department of Transportation (TxDOT)

Commitment Measures: Commitment letter signed by Ken Zigrang – District Planner, TxDOT, March 19, 2004

TxDOT allows VIA to operate and maintain 4 VIA Park and Ride public parking facilities for the public to access VIA buses on state highway right-of way through Multiple Use Agreements.

TxDOT maintains 25 carpool public parking facilities in San Antonio and the surrounding area counties on state highway right-of-way for citizens to use for carpooling.

TxDOT allows the City of San Antonio to operate and maintain 16 general public parking areas on state highway right-of-way through Multiple Use Agreements.

Courtesy Patrol Crews assist stranded motorists on Bexar County freeways 24 hours per day thus helping minimize obstructions and traffic congestions.

For highway maintenance in Bexar County, postpone highway mowing on the right-of-way until after 12:00 noon on Air Quality Health Alert (AQHA) days.

For highway construction and maintenance, postpone of delay highway work activities that require lane closures and would result in significant traffic congestion.

Propane fueling facilities were installed at all 16 maintenance offices in San Antonio District in FY 2002.

Use of TransGuide changeable message signs to inform motorists of vehicle accidents ahead, estimated travel times, lanes closed, detours etc. and thereby help reduce congestion and minimize the time required to open lanes after accidents and other highway incidents.

Maintain state vehicles according to manufacturer's tune-up and emissions control standards.

Continue to purchase alternative fueled sedans and pick-ups for the state fleet.

TxDOT has in place several strategies to allow flexibility on Air Quality Health Alert Days. These include but are not limited to:
Notifying all employees of pending Air Quality Health Alert Days by electronic mail the day before; allowing employees to better plan their travel.
Refueling of TxDOT vehicles is restricted until the cooler evening hours.
TransGuide messages to travelers to limit driving due to ozone levels.
Postpone lawn mowing or use of gas powered lawn equipment at office grounds and for landscape maintenance contracts on AQHA days.
In highway construction, contractors may not close any lanes during rush hours.
Use alternative fuels in state vehicles.
Agency diesel vehicles are fueled with Tx-LED

Voluntary Measures
Utilizing flextime by employees, staggering staff arrival to avoid rush hour during the ozone season.
During AQHAs, ask outlying offices to restrict travel to the main complex.
Use of propane fuel in state vehicles in strongly encouraged.
Encourage employees to use energy conservation measures (ie., turn off vehicle engines when not in use at home and at work).
Instruct employees to practice efficient driving practices such as avoiding excessive idling, minimizing cold starts by combining trips, and avoiding jackrabbit acceleration.
Ask outlying offices to postpone or minimize travel to the district headquarters complex.

UT Health Science Center at San Antonio
Commitment Measures: Commitment letter signed by Michael A. Charlton, Ph.D. – Director of Environmental Health and Safety, UTHSCSA, February 27, 2004
An on-site vehicle preventive maintenance program to reduce fleet vehicle emissions.
The University has a lighting retrofit project in place, which will decrease energy consumption.
Maintain fleet vehicles and buses according to manufacturer's tune-up and emissions control standard on all UTHSCSA vehicles.
All grounds keeping staff will not mow lawns or use gas-powered lawn equipment during an AQHA.
Refuel vehicles and buses carefully and in the cooler evening hours during an AQHA.
All Paint Shop employees will limit use of oil-based paints, varnishes, and degreasers to days that are not an AQHA.
Have reduced the number of University Police vehicles and have officers on bike patrol.

Voluntary Measures
Participate in voluntary vehicle emissions testing and maintenance programs.
Allow flextime, compressed workweek, and/or telecommuting to employees. The University has policies in place for flextime and telecommuting, with a 20 % employee participation rate.
Encourage employees to use general energy conservation measures (i.e., turn off lights and equipment to reduce power load when not in use, both at home and work).
Instruct employees and fleet drivers to practice efficient driving, such as avoiding successive idling, minimizing cold starts by combining trips, avoiding jackrabbit acceleration, driving 55 mph.
Consider alternative fuels for vehicle fleets (10 or more vehicles per fleet).
Encourage employees to bring lunch to work or walk to avoid car travel during lunchtime.

Further Ozone Reduction Measures
UTHSCSA has entered into a contract to upgrade boiler controls and reduce emissions from the main campus central energy plant. Upgrades will be done by July 31, 2005 and include emissions controls, burner management system, combustion controls, and emissions testing and verification. NOx emissions will be reduced by greater than 75%; CO will be reduced by 25%.

Valero Energy Corporation
Voluntary Measures: Letter signed by Julie Klumpyan, Government Affairs, Valero Energy Corporation, March 12, 2004
Valero provided lower RVP gasoline during the ozone season of 1998.
All area refineries voluntarily provided lower RVP (7.8) during ozone season of 1999.
Valero Energy Corporation has provided fuel with a lower average sulfur level (150 ppm or less) in their gasoline over the past three years.
Valero now produces Texas Low Emission Diesel.
Valero's Three River's Refinery averaged 80 ppm sulfur in 2003.
Encourage employees to bring a lunch or walk to avoid car travel during lunchtime.
Valero Energy Corporation has a company cafeteria which reduces car travel during lunch.

VIA Metropolitan Transit
Commitment Measures: Commitment letter signed by Priscilla Ingle – Vice President Public Affairs, VIA Metropolitan Transit, February 26, 2004
Diesel Fleet Emissions Reductions
Voluntarily retrofitted all pre 19998 EPA emissions certified, Heavy-Duty (HD), diesel powered buses with exhaust catalysts (catalytic converters).
Since 1999, 345 early model, HD diesel buses have been replaced with late model propane and clean burning, diesel engine HD buses for a minimum 67% reduction in NOx emissions.
61 HD buses better CFFV ULEV emissions standards.
Streetcars:
5-each, diesel powered streetcars replaced with LPG (CFFV LEV) streetcars for a 71% reduction in NOx emissions on a per vehicle basis.
4-each, diesel powered streetcars repowered with LPG (CFFV LEV) engines for a 56% reduction in NOx emissions on a per vehicle basis.
Bus Garage Improvements
Currently expanding LPG fuel dispensing capacity
Replacing solvent based parts cleaners with water/steam type cleaners
On-Street Improvements
Bike racks on all HD buses
Instruct employees and fleet drivers to practice efficient driving, such as, avoiding excessive idling, minimizing cold starts by combining trips, avoiding jackrabbit acceleration, driving 55 mph maximum. These practices are taught and monitored.
Electricity Consumption
Committed to include International Energy Conservation Codes on new construction projects.

Voluntary Measures
Propane (LPG) Fleet Emissions Reductions
Operates alternatively fueled (LPG) vehicles

92-each, dedicated and bi-fuel, transit patrol cars and support vehicles
105-each, dedicated LPG, paratransit vehicles
67-each, dedicated LPG, 30-ft passenger buses certified to CFFV LEV standards
9-each, dedicated LPG, streetcars. Certified to CFFV LEV standards
A TERP grant application is being prepared to repower/retrofit 67 each CFFV LEV propane engines to achieve a 28% reduction in NOx emissions on a per vehicle basis, bettering CFFV ULEV standards.
Preparations are underway to replace the current paratransit fleet vehicles with new vehicles that are expected to better CFFV ULEV standards and provide a minimum, 70% reduction in NOx emissions on a per vehicle basis.
Supports efforts to expand the use of propane as an automotive fuel
Provides propane related technical support to other fleets
Actively participates in propane engine and motor fuel R&D
Diesel Fleet Emissions Reductions
281 HD buses operate on Diesel #1 versus Diesel #2 for reduced levels of NOx and PM emissions.
61 HD buses operated on Texas Low Emissions Diesel (ULSD).
Preliminary grant approval has been received to retrofit 217 diesel powered HD buses with EGR and PM filters. One retrofitted the NOx emissions, on a per vehicle basis, will be reduced at least 40% and will better CFFV ULEV standards.
Preliminary grant approval has been received to fund the pull-ahead use of Texas Low Emission Diesel in all pre-2004 emissions certified HD diesel buses for a 7% reduction in NOx.
Scheduled to replace, within 2 years, 1998 and 1992 year model HD buses to achieve a 77% and 50% (respectively) reductions in NOx emissions on a per vehicle basis.
Within 2-years, following the approval and implementation of retrofit and replacement programs, all diesel operated HD buses are expected to operate at emissions levels that are better CFFV ULEV standards. This reduction will provide an overall 46% reduction in diesel fleet NOx emission compared to current (early 2004) levles and a 77% reduction in HD diesel fleet NOx emissions since 1999.
Bus Garage Improvements
Recovers paint solvents
Planned CARB compliant booth replacement
61-buses equipped with dry-break fuel nozzles
On-Street Improvements
Tree planting at bus stops program
Employee Incentives
Provides fee fares to employee bus riders
Allows flextime reducing utility peaks
Provides reserved parking spaces for employees who carpool
Education and Cooperation:
Business
Operates a business pass program (over 100 companies currently provide bus passes to their employees on site, at cost or reduced price).
Public
Provides advertising to encourage transit ridership
Encourages employers to provide discounts as incentives to transit riders
Sponsors a yearly Environmental Symposium (3 years)
Educates students about transit (Classroom on Wheels Project)
Promotes AACOG's Guaranteed Ride Home Program
Electricity Consumption

Since 2001, VIA has reduced electricity consumption by 8%
VIA continues its efforts to reduce electricity consumption
Lighting retrofits
Employee awareness
Garage facility retrofits
VIA is an active member of the Metropolitan Partnership for Energy working to increase energy efficiency and reduce pollution in the San Antonio area.
Encourage employees to bring a lunch or walk to avoid car travel during lunchtime.
Maintain fleet vehicles and buses according to manufacturer's tune-up and emissions control standard.
Signs are posted throughout the VIA facility that promote ozone reduction measures.
Ninety percent of all vehicles are refueled after 8:00 p.m. during an AQHA.
Will not mow the lawn or use gas powered lawn equipment during an AQHA as much as possible.
Will limit the use of oil-based paints, varnishes, and degreasers during an AQHA as much as possible.

Transportation Emission Reduction Measures

Introduction

Transportation Emission Reduction Measures (TERMs) are strategies or actions that can be employed to offset increases in nitrogen oxide (NOx) and volatile organic compound (VOC) emissions from mobile sources. All TERMs are intended to reduce either the number of vehicle trips, vehicle miles traveled, or both. These strategies may include ridesharing and telecommuting programs, clean fuel vehicle programs, which were all described in previous sections, and improved transit/ bicycling facilities, or other possible actions such as intersection improvement and signalization.

Many of the transit and highway projects included in the MPO's Transportation Improvement Programs (TIP), as well as, the non-federally funded roadway projects sponsored by the local governments in the San Antonio region qualify as TERMs projects. This is because they aim at reducing congestion and the number of trips made by vehicles, and ultimately, improving the air quality. Table-K14, below, includes eligible TERMs projects that were or are scheduled to be completed between 1999 and 2007.

- It is important to note that TERMs can be quantified as creditable reductions. While the reductions have not been included in the attainment demonstration of the San Antonio proposed revisions to the State Implementation Plan, local air quality planners are now researching measures to make the TERMs enforceable. The region is intent on making them enforceable and calculating credit for them in coordination with the state and the local San Antonio / Bexar County Metropolitan Planning Organization. Even if credit is not taken here for the implemented TERMs projects in the region, the benefits of the reductions accrue as "Additional Evidence" that the San Antonio region will reach attainment.

Table K-14: Transportation Emission Reduction Measures
San Antonio 4-County EAC Region
2007 Emissions Reductions (lbs/day)

PROJECT TYPE	AGENCY	PROJECT NAME	FROM	TO	LET DATE	VOC Lbs/day	NOx Lbs/day
Sidewalk	TxDOT	Acme Road	Old Highway 90		1999	0.069	0.058
Sidewalk	TXDOT	Gevers St	IH 10	Southcross	2000	0.242	0.204
Sidewalk	TXDOT	Henderson Pass	Thousand Oaks	Gold Canyon	2000	0.202	0.170
Sidewalk	TXDOT	IH 410	Bertetti	Marbach	2000	0.050	0.042
Bike/Ped	TXDOT	Mission Trails (Phase 3)	E. Southcross	Mitchell St.	2000	0.712	0.600
Bike/Ped	TxDOT	Mitchell St.	Probandt to	Roosevelt	2000	0.104	0.088
Bike/Ped	TxDOT	Nogalitos (LP 353)	Zarzamora / New Laredo Hwy	Surrey	2000	0.235	0.198
Bike/Ped	TXDOT	Probandt St.	US 90	Mitchell	2000	0.014	0.012
Bike/Ped	TXDOT	Prue Rd	Laureate	Fredericksburg	2000	0.065	0.054
Bike/Ped	TXDOT	Rittiman	Austin Hwy (LP 368)	Harry Wurzbach	2000	0.124	0.105
Bike/Ped	TXDOT	Timber Path Bikeway	Les Harrison	Grissom Rd.	2000	0.166	0.140
Bike/Ped	TXDOT	Bitters Rd	Broadway	Nacogdoches Rd.	2001	0.282	0.237
Bike/Ped	TxDOT	Callaghan	Hemphill	Culebra	2001	0.266	0.225
Bike/Ped	TXDOT	Coliseum Rd.	East Houston St.	Gembler Rd.	2001	0.123	0.104

PROJECT TYPE	AGENCY	PROJECT NAME	FROM	TO	LET DATE	VOC Lbs/day	NOx Lbs/day
Bike/Ped	TxDOT	East Houston St.	Walters	Onslow	2001	0.054	0.045
Bike/Ped	TXDOT	East Houston St.	Onslow St.	Salado Creek	2001	0.084	0.071
Bike/Ped	TXDOT	Pearsall Rd (FM 2536)	Loop 13 (Military Drive)	IH 410	2001	2.630	2.216
Bike/Ped	TXDOT	Pecan Valley Dr	J St. to	IH 10	2001	0.049	0.041
Bike/Ped	TXDOT	Pleasanton	Moursund	Gillette	2001	0.027	0.023
Bike/Ped	TXDOT	Southcross	WW White (LP 13)	Loop 410	2001	0.209	0.176
Bike/Ped	TXDOT	Uhr Lane	Higgins	Thousand Oaks	2001	0.210	0.177
Bike/Ped	TXDOT	New World	Crestway	Montgomery	2004	0.050	0.042
Sidewalk	TXDOT	New World	Montgomery Dr	Walzem Rd (FM 1976)	2004	0.050	0.042
Sidewalk	Federal	Alamo	Cedar	San Antonio River	2003	0.031	0.026
Sidewalk	TXDOT	W.W. White Rd. (Loop 13)	Seale Road	IH-10	2004	0.336	0.283
Sidewalk	TXDOT	Grissom/Culebra (FM 471)	SH 16	Loop 1604	2003	2.040	1.719
Sidewalk	TxDOT	Southcross Blvd.	S. New Braunfels to S. Presa St.	S. Presa St.	2005	0.107	0.090
Sidewalk	TxDOT	Hunt Lane	Marbach to US 90	us 90	2004	0.273	0.230
Sidewalk	Federal	Isom	Ramsey	US 281	2004	0.084	0.071
Sidewalk	COSA	Roland (US 87)	IH 10	Rigsby Avenue	2004	0.100	0.084
Sidewalk	COSA	SH 218 (Pat Booker Road)	Loop 1604	FM 78	2004	0.998	0.841
Sidewalk	COSA	Sunset	Jones Maltsberger	Teak	2004	0.135	0.114
Sidewalk	Bexar	Kitty Hawk Rd	Miller Rd.	Converse City Limits	2004	0.070	0.059
Bikeway	COSA	UTSA to OLLU Corridor	Houston St.	24th St.	2004	0.507	0.427
Bikeway	COSA	Cincinnati	St. Mary's University	Navidad	2004	0.189	0.159
Bikeway	COSA	Cincinnati / Ashby	Navidad	North St. Mary's St.	2004	0.189	0.159
Bikeway	COSA	Alamo / Broadway Corridor	Josephine	The Alamo	2004	0.297	0.251
Bikeway	Bexar	Crestway	Miller Road	New World	2004	0.070	0.059
Sidewalk	Bexar	New World	Crestway	Miller Road	2004	0.026	0.022
Bike racks	COSA		Various Locations		2004	0.000	0.000
Sidewalk	COSA	Clark	Southcross	Hot Wells	2004	0.073	0.062
Sidewalk	Bexar	Crestway Drive	New World	Windcrest City Limits	2004	0.060	0.051
Sidewalk	COSA	Hot Wells	IH 37	New Braunfels	2004	0.016	0.013
Sidewalk	COSA	E. Houston	Pine	Walters	2004	0.060	0.050
Bike lane	COSA	Ingram	Callaghan	Benrus	2004	0.215	0.181
Sidewalk	COSA	Blanco Road (FM 2696)	Lockhill Selma	West Avenue	2004	0.421	0.355
Bike lane	Univ City	SH 218	Loop 1604	FM 78	2004	0.928	0.782
Sidewalk	COSA	Flores, S	0.6 Mi N of Malone	Octavia	2005	0.191	0.161
Sidewalk	COSA	Mayfield	Commercial	Zarzamora	2005	0.024	0.020
Sidewalk	COSA	McCullough	Basse	RR Tracks	2005	0.087	0.073
Sidewalk	COSA	Nakoma	@ US 281	4C	2005	0.256	0.216
Sidewalk	COSA	Woodlawn	Bandera	Maiden 4C	2005	0.104	0.087
Sidewalk	COSA	Sunset	Teak	Broadway 4C	2005	0.103	0.086
Sidewalk/bike	COSA	Callaghan	Bandera	Horseshoe Bend	2007	0.414	0.349
Bike lane	COSA	SAC to CBD	Howard	4th	2001	0.082	0.069
Bike lane	COSA	Montana/Nevada	Cherry	Meerscheidt	2001	0.040	0.034

PROJECT TYPE	AGENCY	PROJECT NAME	FROM	TO	LET DATE	VOC Lbs/day	NOx Lbs/day
Bike lane	COSA	N.Zarzamora	Nogalitos	Theo	2001	0.158	0.133
Bike lane	COSA	N. St. Mary's	Lexinton	Huisache	2001	0.199	0.168
Bike lane	COSA	Callaghan	Old Highway 90	New HWY 90	2001	0.128	0.108
Bike lane	COSA	S. Zarzamora	SW Loop 410	IH 35	2001	0.338	0.285
Bike lane	COSA	Caliza	Encino Rio	Evans Rd.	2001	0.061	0.052
Bike lane	COSA	UTSA to SAC	Buena Vista	San Pedro	1999	0.299	0.252
Bike lane	COSA	Les Harrison	Culebra	Dover Ridge	2000	0.313	0.264
Bike lane	COSA	Josephine Grayson	Broadway	New Braunfels	2000	0.085	0.072
Bike lane	COSA	Walters	Fair Ave.	Rigsby Avenue	2000	0.235	0.198
Bike lane	COSA	Villaret	Zarzamora	Hwy 16	2000	0.074	0.062
Sidewalk	COSA	RICE RECONSTRUCTION	W. W. WHITE	TO SEMLINGER	2004	0.033	0.028
Sidewalk	Comal	New Braunfels	LP 337	0.8 KM N of Walnut Ave.	2004	0.197	0.166
Bike path	CoSa	Malone / Theo	Quintana	Concepcion Park	2004	0.655	0.552
Side walk	COSA	GEN MCMULLEN	' ROSELAWN	TO COMMERCE	1999	0.664	0.560
Bike path	COSA	AVENUE B (BICYCLE LANES)	MULBERRY	TO BRACKENRIDGE	2000	0.095	0.080
Bike path	COSA	MONTANA STREET BIKE LANE:	ALAMODOME	TO WALTERS	6/15/2001	0.018	0.016
Bike path	COSA	VILLARET BICYCLE TRANSPORTATION	W. Villaret	E. Villaret	6/15/2001	0.107	0.090
Bike path	COSA	ZARZAMORA BIKE LANE	IH 35	TO LOOP 410	6/15/2001	0.000	0.000
Bike path	COSA	EAGLELAND/RIVERWALK LINK	Eagleland Drive	Guenther Street Bridge	4/15/2006	0.021	0.018
Side walk	COSA	MCKAY	(400 Block)	500 BLKS	2/15/2001	0.008	0.006
Side walk	COSA	HARVARD TERRACE	YALE	TO UNIVERSITY	2/15/2001	0.001	0.001
Side walk	COSA	DELL PLACE DRAINAGE PROJECT	North Freeman	Dead end	3/15/2001	0.0001	0.0001
Side walk	COSA	HARDEMAN ST SIDEWALKS	MESQUITE	TO HACKBERRY	3/15/2001	0.002	0.002
Side walk	COSA	GEVERS-IH 10	GEVERS	SOUTHCROSS	10/15/2001	0.131	0.110
Side walk	COSA	NEW BRAUNFELS	RIGSBY	SOUTHCROSS/IH 37	10/15/2001	0.278	0.234
Side walk	COSA	HENDERSON PASS SIDEWALKS	Thousand Oaks	to Gold Canyon.	2001	0.818	0.689
Side walk	COSA	DANBURY SIDEWALKS:	NACOGDOCHES	TO BROADWAY	1/15/2002	0.021	0.018
Side walk	COSA	RAY BON DRIVE SIDEWALKS	Eisenhauer	to Village Haven	1/15/2002	0.031	0.026
Side walk	COSA	NEW BRAUNFELS	IH 35	TO GRAYSON	2/15/2002	0.068	0.057
Side walk	COSA	PEDESTRIAN BRIDGE	War Horse	Trading Post	7/15/2002	0.0005	0.0004
Side walk	COSA	HOOVER STREET	NOGALITOS	CHARLOTTE	12/15/2003	0.003	0.002
Side walk	COSA	2003 NAMP SIDEWALK	McCullough	Mulberry	6/15/2004	0.595	0.502
Side walk	COSA	NAVAJO AREA STREETS	(NAVAJO/HUTCHINS/BARLITE)	(NAVAJO/HUTCHINS/BARLITE)	7/15/2004	0.159	0.134
Side walk	COSA	MC CARTY SIDEWALKS & CURBS:	LORENE	BLANCO	7/15/2004	0.031	0.026
Side walk	COSA	HARRIS STORM DRAINAGE	ALVAREZ	(GLASS/CASS/HALSTEAD)	11/15/2004	0.038	0.032
Side walk	COSA	KONO:	GEMBLER	BELGIUM	4/15/2005	0.026	0.022

PROJECT TYPE	AGENCY	PROJECT NAME	FROM	TO	LET DATE	VOC Lbs/day	NOx Lbs/day
Side walk	COSA	OCTAVIA	#63 PHASE II	PART B	6/15/2005	0.103	0.087
Side walk	COSA	LA MANDA -	WEST AVENUE	BUCKEYE	3/15/2006	0.006	0.005
Side walk	COSA	ROSABELL STREET	CULEBRA	INEZ	5/15/2006	0.006	0.005
Side walk	COSA	CINCINNATI	FREDERICKSBURG	IH 10	5/15/2007	0.019	0.016
Side walk	COSA	CORNELL	BRAZOS	COLORADO	5/15/2007	0.009	0.007
Signal Improvement	TxDOT	US 281	At Borgfeld, Bulverde, Wilderness Oaks,	and Stone Oak Roads	2003	3.797	2.327
Signal Improvement	Bexar	Foster Road	at Candlemeadow	4C	2005	0.253	0.155
Signal Improvement	Bexar	Foster Road	at Summer Fest	4C	2005	0.059	0.036
Signal Improvement	Comal	SH46	HEB driveway	.	2001	0.052	0.041
Signal Improvement	Comal	FM 725	At County line road	.	2001	1.003	0.788
Signal Improvement	Comal	FM 3009	At FM 2252 in Garden Ridge		2001	0.575	0.452
Signal Improvement	City of New Braunfels		Union	Common	2004	0.075	0.059
Signal Improvement	Guadalupe	FM 3009	Savana/Verde Dr.		2001	2.097	1.488
Signal Improvement	Guadalupe	SH46	At US 90	.	2004	1.165	0.827
Signal Improvement	Guadalupe	SH46	At US 90	.	2004	0.272	0.193
Signal Improvement	Guadalupe	FM 3009	IH 35E	0.21 Mi SE of IH 35	2004	1.010	0.717
Intersection Improvement	TxDOT	Hunt Lane	Marbach	to US 90	2004	2.790	1.674
Intersection	TxDOT	Bitters	East of West Ave (W.of US 281)		2005	5.529	3.317
Intersection Improvement	TxDOT	Wurzbach	Ironside	to IH 10	2004	6.251	3.751
Intersection Improvement	TxDOT	IH 10	@ Callaghan Road		2004	4.664	2.798
Intersection Improvement	TxDOT	IH 10	IH 10 West at Huebner Road		2004	4.664	2.798
Intersection Improvement	TxDOT	Loop 1604	SH 16	to FM 1937	2004	0.173	0.104
Intersection	TxDOT	Loop 1604	IH 35	to SH 16	2004	3.731	2.239
Intersection	TxDOT	IH 10	@ DeZavala Road		2004	4.961	2.977
Intersections	COSA	JAMES PARK DEVELOPMENT	Rittiman and Holbrook.		2005	2.292	1.375
Intersections	COSA	WEST AVE	@ Larkspur	Silver Sands, Rhapsody and Nakoma	2000	15.325	9.195
Intersections	COSA	TEZEL	Tezel	Timber Path	2000	3.168	1.901
Intersections	COSA	Broadway	BROADWAY	AT WETMORE ROAD	2001	2.044	1.227
Intersections	COSA	SOUTHWEST CRAFT	NAVARO	AND AUGUSTA	2004	0.842	0.505

PROJECT TYPE	AGENCY	PROJECT NAME	FROM	TO	LET DATE	VOC Lbs/day	NOx Lbs/day
		CNTR					
Park & Ride	VIA	CROSSROADS	IH-10W & Loop 410	-	1988	2.0388	1.7181
Park & Ride	VIA	ELLIS ALLEY	Chestnut & Center Street	-	1998	4.1661	3.5108
Park & Ride	TXDOT	UNIVERSITY	IH 10 W & Loop 1604	-	1993	15.150	12.767
Park & Ride	TXDOT	ELMENDORF	US 181 S.& Loop 1604	-	1981	2.5730	2.1682
Park & Ride	Privately Owned	ST. HEDWIG	FM 1346 & Pittman Rd.	-	1988	0.5293	0.4460
Park & Ride	TXDOT	RANDOLPH BLVD	IH 35 N & Crestway	-	1980	3.0382	2.5602
Transit CT.	VIA	INGRAM	Ingram Road & Northwestern	-	1988	0.5465	0.4606
Transit CT.	TxDOT	KEL-LAC	US 90 W. & Military Dr.	-	2004	1.5582	1.3131
Grade Sep	TxDOT	Loop 1604	0.52 KM N of FM 471 (Culebra Rd.)	0.98 KM S of FM 471 (Culebra Rd.)	2001	17.896	10.738
Grade Sep	TxDOT	IH 410	SH 16	UPRR	2004	3.722	2.233
Grade Sep	TxDOT	US 281	Borgfeld Dr		2006	17.896	10.738
Traffic Flow Improvements	TxDOT	Acme Road	Old Highway 90		1999	0.622	0.207
Traffic Flow Improvements	TxDOT	Evers Rd.	N. of Glen Ridge	to Daughtry Dr.	1999	1.335	0.445
Traffic Flow Improvements	TxDOT	FM 2522 (Perrin Beitel)	@ IH 410		1999	0.526	0.175
Traffic Flow Improvements	TxDOT	FM 78	Bexar Co. Ln.	to FM 3009	1999	2.653	0.884
Traffic Flow	TxDOT	Houston (FM 1346)	Pop Gunn		1999	2.002	0.667
Traffic Flow Improvements	TxDOT	IH 10	0.2 mile South of Callaghan Road	0.2 mile South of N. Crossroads Blvd.	1999	27.854	9.285
Traffic Flow Improvements	TxDOT	IH 410	Interchange at US 281 Fr: US 281	To: Nacogdoches	1999	6.472	2.157
Traffic Flow Improvements	TxDOT	SH 151	At Callaghan Rd		1999	0.335	0.112
Traffic Flow Improvements	TxDOT	Tezel	at Timber Path		1999	0.609	0.203
Traffic Flow Improvements	TxDOT	US 281	0.590 KM N of LP 1604	0.746 KM N of LP 1604	1999	6.398	2.133
Traffic Flow Improvements	TxDOT	West Avenue	FM 1535 (NW Military Hwy)	IH 410	1999	2.646	0.882
Traffic Flow Improvements	TxDOT	Wurzbach Parkway	Lockhill-Selma	to FM 1535 (NW Military Hwy)	1999	0.460	0.153
Traffic Flow Improvements	TxDOT	24th	Commerce	to Culebra	2000	2.353	0.784
Traffic Flow Improvements	TxDOT	Ackerman Rd.	IH 10	Dietrich	2000	0.190	0.063
Traffic Flow Improvements	TxDOT	Hildebrand	IH-10	Breeden	2000	2.767	0.922
Traffic Flow	TxDOT	Hildebrand	@ Hwy. 281		2000	0.454	0.151

PROJECT TYPE	AGENCY	PROJECT NAME	FROM	TO	LET DATE	VOC Lbs/day	NOx Lbs/day
Improvements							
Traffic Flow Improvements	TxDOT	Huebner Road	Evers Road	East of City Limit (Redbird Lane)	2000	1.288	0.429
Traffic Flow Improvements	TxDOT	Lockhill Selma	George Road	Whisper Path	2000	0.846	0.282
Traffic Flow Improvements	TxDOT	O'Connor Rd	Crosswinds	IH 35	2000	3.418	1.139
Traffic Flow Improvements	TxDOT	Wetmore	At Broadway		2000	0.203	0.068
Traffic Flow Improvements	TxDOT	Wurzbach Rd	0.6 Mi East of Ingram Rd	Leon Valley WCL	2000	1.945	0.648
Traffic Flow Improvements	TxDOT	Coliseum Rd.	Belgium Rd.	IH 35	2001	0.712	0.237
Traffic Flow Improvements	TxDOT	Culebra Rd (FM 471)	At Loop 1604		2001	4.097	1.366
Traffic Flow Improvements	TxDOT	IH 410	Jackson-Keller Road	Honeysuckle Lane	2001	42.811	14.270
Traffic Flow Improvements	TxDOT	IH 410	Honeysuckle Lane	Blanco Rd	2001	25.183	8.394
Traffic Flow Improvements	TxDOT	Loop 1604	0.6 KM North of Military Dr	US 90	2001	10.960	3.653
Traffic Flow Improvements	TxDOT	Loop 1604	1.6 KM N. of FM 471 (Culebra Rd)	0.6 KM North of Military Dr.	2001	10.818	3.606
Traffic Flow Improvements	TxDOT	Loop 345	At Cinnamon Creek &	USAA Bvld	2001	0.136	0.045
Traffic Flow	TxDOT	Wurzbach Road	Crystall Hill	Crystall Hill	2001	1.361	0.454
Traffic Flow Improvements	TxDOT	IH 35	At Coliseum & Walters		2002	0.053	0.018
Traffic Flow	TxDOT	IH 410	At SH 151		2002	0.009	0.003
Traffic Flow Improvements	TxDOT	Pleasanton	Southcross	Mayfield	2002	0.981	0.327
Traffic Flow Improvements	TxDOT	Ralph Fair Rd. (FM 3351)	Fawn Mountain, Pimlico, Dietz-Elkhorn	Fair Oaks Parkway	2002	4.243	1.414
Traffic Flow Improvements	TxDOT	SH 151	0.22 Miles West of Callaghan Rd.	0.3 Miles East of IH 410	2004	17.904	5.968
Traffic Flow Improvements	TxDOT	SH 151	0.3 Miles East of IH 410	1.00 Miles East of Loop 1604	2004	19.142	6.381
Traffic Flow Improvements	TxDOT	Ironside	at Wurzbach		2004	0.326	0.109
Traffic Flow Improvements	Bexar	Mission Rd.	N. of San Antonio River	Mission Parkway	2004	0.070	0.023
Traffic Flow Improvements	CoSA	Thousand Oaks	At Broken Oak, Ledge View, Turkey Point,	Pebble Forest & Oak View	2004	2.118	0.706
Traffic Flow	TxDOT	Zarzamora	IH 410	Applewhite Road	2004	1.999	0.666
Traffic Flow Improvements	TxDOT	Applewhite Road	Zarzamora	Watson Road	2004	1.999	0.666
Traffic Flow Improvements	TxDOT	Loop 1605	FM 1937	IH 37	2004	1.243	0.414
Traffic Flow Improvements	TxDOT	Military Dr., S.E. (LP 13)	Padre	Mission Rd 4C	2005	0.486	0.162

PROJECT TYPE	AGENCY	PROJECT NAME	FROM	TO	LET DATE	VOC Lbs/day	NOx Lbs/day
Traffic Flow Improvements	Comal	LP 337	0.16 KM N of BI 35-H	.48 KM N of UPRR	2001	3.446	1.378
Traffic Flow Improvements	Guadalupe	SH 46	2.2 s of FM 758 New Braunfels	0.2 Mi s of FM 758 Camp Willow Rd.	2002	5.878	2.177
Traffic Flow Improvements	Guadalupe	FM 78	Bexar Co. Ln.	FM 3009	2002	4.299	1.592
Traffic Flow Improvements	Wilson	FM 1346	US 87 w of Lavernia	FM 775	2001	1.400	0.560
Traffic Flow Improvements	Guadalupe	SH 46	0.2 Mi S of FM 758	Comal Co line	2004	4.219	1.562
Traffic Flow Improvements	Guadalupe	SH 123	Fr US 90 Kingsbury St	IH 10	2004	1.193	0.442
Traffic Flow Improvements	COSA	36th ST.	US90	Growdon	2007	2.792	0.931
Traffic Flow	COSA	BLANCO ROAD	BLANCO ROAD - HILDEBRAND	SUMMIT PHASE 1	2006	3.602	1.201
Traffic Flow	COSA	WURZBACH PARKWAY PHASE IV	Military Highway	Blanco Road	2002	17.353	5.784
Traffic Flow	COSA	WURZBACH RD:	INGRAM RD	LEON VALLEY	2002	4.649	1.550
Traffic Flow	COSA	HAMILTON	GUADALUPE	LAREDO	1999	0.582	0.194
Traffic Flow	COSA	WURZBACH RD @ VANCE JACKSON	PROBANDT	PRESA	1999	2.227	0.742
Traffic Flow	COSA	MITCHELL STREET	IH 410	RAY ELLISON	1999	0.336	0.112
Traffic Flow	COSA	VALLEY HI DRIVE			1999	0.412	0.137
Traffic Flow	COSA	CHIPINQUE DRAINAGE	General McMullen	Escuela	1999	1.297	0.432
Traffic Flow	COSA	ZARZAMORA - CULEBRA TO COMMERCE	CULEBRA	COMMERCE	1999	2.705	0.902
Traffic Flow	COSA	CALAVERAS -	SAUNDERS	GUADALUPE	1999	0.568	0.189
Traffic Flow	COSA	COURTLAND STREET	MCCULLOUGH	ST. MARY'S	1999	0.424	0.141
Traffic Flow	COSA	GUADALUPE GARDENS PHASE II			1999	1.241	0.414
Traffic Flow	COSA	CHICO/KNOX/MARGIL			1999	0.024	0.008
Traffic Flow	COSA	FOLYN/JERSEY/CUSTER/ ORANGE			1999	0.280	0.093
Traffic Flow	COSA	TRAVIS	ZARZAMORA	HAMILTON	1999	0.566	0.189
Traffic Flow	COSA	VILLA CORONADO STREETS, PHASE III A			1999	0.097	0.032
Traffic Flow	COSA	MAYFIELD	SOMERSET	LAREDO HWY	1999	0.122	0.041
Traffic Flow	COSA	HAZEL DRAINAGE -	ZARZAMORA	BRAZOS	1999	0.751	0.250
Traffic Flow	COSA	LILLITA	GEN. MCMULLEN	LAS PALMAS	1999	0.108	0.036
Traffic Flow	COSA	ADVANCE & BRICE			1999	0.045	0.015
Traffic Flow	COSA	calle morelia drainage			1999	0.095	0.032
Traffic Flow	COSA	EMORY / KENTUCKY			1999	0.120	0.040
Traffic Flow	COSA	26TH STREET	TRAVIS	CULEBRA	1999	0.147	0.049
Traffic Flow	COSA	WURZBACH PARKWAY PHASE II			1999	11.623	3.874
Traffic Flow	COSA	KEITHA AREA STREETS PHASE II			1999	0.645	0.215
Traffic Flow	COSA	MUSKOGEE -	ACME	40TH	1999	0.080	0.027
Traffic Flow	COSA	BOEHMER -	BURBANK LOOP	S. FLORES	1999	0.014	0.005
Traffic Flow	COSA	DEWITT -	IH 10	FAIRMONT	1999	0.028	0.009
Traffic Flow	COSA	CLAREMONT/ELEANOR/NATALEN,PH			1999	0.234	0.078

PROJECT TYPE	AGENCY	PROJECT NAME	FROM	TO	LET DATE	VOC Lbs/day	NOx Lbs/day
		I&MAHNCKE PH IV					
Traffic Flow	COSA	LAKE BLVD/WOODLAWN/STREETS	AROUND WOODLAWN LAKE		1999	2.077	0.692
Traffic Flow	COSA	S. FLORES DRN #70-70A, PH. II--PART 2			2000	0.000	0.000
Traffic Flow	COSA	34TH STREET	HWY 90	CASTROVILLE	2000	0.064	0.021
Traffic Flow	COSA	27TH -	CULEBRA	RIVAS	2000	0.052	0.017
Traffic Flow	COSA	21ST STREET	SALINAS	POPLAR	2000	0.268	0.089
Traffic Flow	COSA	EASTLAWN NEIGHBORHOOD STREETS PHASE II			2000	0.435	0.145
Traffic Flow	COSA	SOUTHLAWN-	MERIDA	CASTROVILLE	2000	0.089	0.030
Traffic Flow	COSA	MADRID-	MERIDA	CASTROVILLE RD	2000	0.025	0.008
Traffic Flow	COSA	GRANDVIEW NEIGHBORHOOD STREETS PH. IIIA		(K STREET)	2000	0.047	0.016
Traffic Flow	COSA	WURZBACH PARKWAY PHASE III			2000	0.391	0.130
Traffic Flow	COSA	GLENMORE		KENTUCKY	2000	0.047	0.016
Traffic Flow	COSA	VILLA CORONADO STREETS PHASE IIIB			2000	0.043	0.014
Traffic Flow	COSA	ARBOR	TRINITY	SAN MARCOS	2000	0.083	0.028
Traffic Flow	COSA	FAIRDALE -	RITTIMAN	BLOOMDALE	2000	0.323	0.108
Traffic Flow	COSA	STAHL RD. #1038 PHASE I -	FAIRWAY OAKS	BULVERDE	2000	0.273	0.091
Traffic Flow	COSA	BABCOCK & HILLCREST INTERSECTION			2000	1.364	0.455
Traffic Flow	COSA	APPLE VALLEY: HAVEN VALLEY - RAY ELLISON			2000	0.141	0.047
Traffic Flow	COSA	LAS PALMAS -	CHARBEN	26TH	2000	0.129	0.043
Traffic Flow	COSA	CONTOUR DR / EL MONTE ST IMPROVEMENTS			2000	1.697	0.566
Traffic Flow	COSA	EVERS RD -	GLENRIDGE	DAUGHTRY	2000	1.424	0.475
Traffic Flow	COSA	BAYLOR ST -	SAN PEDRO CK.	FLORES ST.	2000	0.010	0.003
Traffic Flow	COSA	CULEBRA AREA STREETS PHASE II			2000	0.901	0.300
Traffic Flow	COSA	HILDEBRAND @ 281			2000	1.040	0.347
Traffic Flow	COSA	LONE OAK/LATIMER:	F ST	BRICE	2001	0.020	0.007
Traffic Flow	COSA	RIP RAP 69-PHIIC PART 3			2001	0.105	0.035
Traffic Flow	COSA	ACKERMAN-	IH 10	DIETRICH	2001	0.216	0.072
Traffic Flow	COSA	CARSON STREET -	WALTERS	FRANK	2001	0.077	0.026
Traffic Flow	COSA	STARCREST -	STUNTMAN	jones maltsberger	2001	0.081	0.027
Traffic Flow	COSA	BOBOLINK 96A	STOREYWOOD	DENEICE	2001	1.828	0.609
Traffic Flow	COSA	MAHNCKE AREA STREETS, PHASE II			2001	0.752	0.251
Traffic Flow	COSA	CRESWELL -	HOUSTON	DEADEND	2001	0.024	0.008
Traffic Flow	COSA	THORAIN:	BUCKEYE	S.P. RAILROAD	2001	0.039	0.013
Traffic Flow	COSA	FRED. RD	SANDOVAL	WOODLAWN	2001	1.472	0.491
Traffic Flow	COSA	HOBART STREET -	ACME RD	40TH ST	2001	0.023	0.008
Traffic Flow	COSA	LAWTON / SW 41ST STREET			2001	0.019	0.006
Traffic Flow	COSA	ORR/SUZETTE/		WINKLE	2001	0.019	0.006
Traffic Flow	COSA	FLEMING	MAYFIELD	PEABODY	2001	0.016	0.005
Traffic Flow	COSA	EVERS RD @ WURZBACH RD INTERSECTION			2001	0.102	0.034
Traffic Flow	COSA	CAPITOL:	BASSE	SAN ANGELO	2001	0.010	0.003
Traffic Flow	COSA	GRANDVIEW	PECAN VALLEY	AMANDA	2001	0.020	0.007

PROJECT TYPE	AGENCY	PROJECT NAME	FROM	TO	LET DATE	VOC Lbs/day	NOx Lbs/day
		NEIGHBORHOOD STS PH IIIB					
Traffic Flow	COSA	PACE -	ELMENDORF	BRAZOS	2001	0.139	0.046
Traffic Flow	COSA	TEXAS / WAVERLY STREETS			2001	0.527	0.176
Traffic Flow	COSA	BASSE ROAD & SAN PEDRO INTERSECTION			2001	1.625	0.542
Traffic Flow	COSA	MONTERREY -	36TH	SAN JOAQUIN	2001	0.467	0.156
Traffic Flow	COSA	BLUERIDGE	GEN MCMULLEN	27TH	2001	0.143	0.048
Traffic Flow	COSA	RIP RAP 69 - PH IIC PART 3A			2001	0.166	0.055
Traffic Flow	COSA	CALLAGHAN:	OLD HWY 90	COMMERCE	2001	1.021	0.340
Traffic Flow	COSA	DUVAL/SEGUIN:	PIERCE	WALTERS	2001	0.223	0.074
Traffic Flow	COSA	24TH ST:	COMMERCE	CULEBRA	2001	0.236	0.079
Traffic Flow	COSA	CLAREMONT/ELEANOR/NATALEN, PH II			2001	0.175	0.058
Traffic Flow	COSA	STRECH	CHAVANEAUX	MALLEY BLVD	2001	0.128	0.043
Traffic Flow	COSA	INDIANOLA:	GARFIELD	CAMARGO	2001	0.008	0.003
Traffic Flow	COSA	ELSMERE:	MICHIGAN	CAPITOL	2002	0.021	0.007
Traffic Flow	COSA	ARBOR:	TRINITY	SAN MARCOS PH II	2002	0.029	0.010
Traffic Flow	COSA	ESCALON ST. #1008			2002	0.051	0.017
Traffic Flow	COSA	S. FLORES DRN #70-70A, PH. II--PART 3			2002	11.316	3.772
Traffic Flow	COSA	OCTAVIA #63 PHASE 1			2002	0.678	0.226
Traffic Flow	COSA	LEONHARDT ROAD @ LOW WATER CROSSING			2002	0.299	0.100
Traffic Flow	COSA	ST. MARYS STREET -	PEREIDA	ROOSEVELT	2002	0.841	0.280
Traffic Flow	COSA	LOCKHILL-SELMA:	GEORGE	WHISPER PATH	2003	0.731	0.244
Traffic Flow	COSA	39TH STREET #58M, PHASE IIA			2003	0.871	0.290
Traffic Flow	COSA	QUINTANA ROAD DRAINAGE #64 EXTENSION			2003	0.648	0.216
Traffic Flow	COSA	S. FLORES:	DURANGO	FRANCISCAN	2003	1.269	0.423
Traffic Flow	COSA	MONTICELLO:	S. GEVERS	HILLJE	2003	0.095	0.032
Traffic Flow	COSA	HIGGINS ROAD:	NACOGDOCHES	STAHL	2003	1.551	0.517
Traffic Flow	COSA	HI LIONS 80 MOD PIII & V			2004	11.176	3.725
Traffic Flow	COSA	BEE STREET:	WALTERS	FRANK	2004	0.030	0.010
Traffic Flow	COSA	ARANSAS:	MEERSCHEIDT	WALTERS	2004	0.077	0.026
Traffic Flow	COSA	FLORES/BREEDEN/BEACON, PHASE II			2004	0.417	0.139
Traffic Flow	COSA	MOCKERT STREET AREA	MOCKERT, FOREST,	(W. LAMBERT, KLINE, CASS)	2004	0.435	0.145
Traffic Flow	COSA	PLEASANTON ROAD:	GILLETTE	LOOP 410	2004	0.000	0.000
Traffic Flow	COSA	NORTHINGTON:	S.W. 36TH	S.W. 35TH	2004	0.075	0.025
Traffic Flow	COSA	FAY STREET / ST JOSEPH:	CREIGHTON	NEW LAREDO HWY, PART 1	2005	0.264	0.088
Traffic Flow	COSA	FAY STREET / ST. JOSEPH:	CREIGHTON	NEW LAREDO HWY, PART 2	2005	0.000	0.000
Traffic Flow	COSA	BELGIUM:	PICARDE	SBC PARKWAY	2005	0.137	0.046
Traffic Flow	COSA	EL MONTE:	BLANCO	SAN PEDRO, PHASE II	2005	0.045	0.015
Traffic Flow	COSA	LANARK DRAINAGE #92A, PHASE 1			2005	0.383	0.128
Traffic Flow	COSA	LARKSPUR:	WEST AVE	BALTIC	2005	0.260	0.087

PROJECT TYPE	AGENCY	PROJECT NAME	FROM	TO	LET DATE	VOC Lbs/day	NOx Lbs/day
Traffic Flow	COSA	SUNSET PH I:	JONES MALTSBERGER	TEAK	2005	1.014	0.338
Traffic Flow	COSA	ALAMO:	DURANGO	CEDAR	2005	0.328	0.109
Traffic Flow	COSA	WURZBACH RD @ IH 10 INTERSECTION			2005	2.128	0.709
Traffic Flow	COSA	ST. MARYS STREET:	ALAMO	PEREIDA	2005	0.202	0.067
Traffic Flow	COSA	ANSLEY BLVD DRAINAGE #1091			2006	0.139	0.046
Traffic Flow	COSA	DUKE AREA STREETS, PHASE I			2006	0.275	0.092
Traffic Flow	COSA	CULEBRA AREA STREETS PHASE IV			2006	0.288	0.096
Traffic Flow	COSA	HOWARD DRAINAGE:	WILDWOOD	EL MONTE	2006	0.018	0.006
Traffic Flow	COSA	AVE MARIA DRAINAGE			2006	0.056	0.019
Traffic Flow	COSA	GOLIAD RD:	PECAN VALLEY	MILITARY DRIVE	2006	0.329	0.110
Traffic Flow	COSA	W. CRAIG:	ELMENDORF	JOSEPHINE TOBIN	2006	0.027	0.009
Traffic Flow	COSA	WOODLAWN AVE:	SAN ANTONIO	LAKE	2006	0.199	0.066
Traffic Flow	COSA	OZARK -	ERSKINE	WILLIAMSBURG	2006	0.064	0.021
Traffic Flow	COSA	FLORIDA:	IH 37	ST MARYS	2006	0.380	0.127
Traffic Flow	COSA	SUNSET PH II:	TEAK	BROADWAY	2006	0.538	0.179
Traffic Flow	COSA	WOODLAWN:	BANDERA	MAIDEN	2006	0.114	0.038
Traffic Flow	COSA	SEMLINGER ROAD -	LORD	RIGSBY	2006	0.434	0.145
Traffic Flow	COSA	STAHL ROAD -	O'CONNOR	JUDSON	2007	1.147	0.382
Traffic Flow	COSA	MARBACH PHASE I -	MILITARY	PINN	2007	0.654	0.218
Traffic Flow	COSA	REDLAND ROAD IMPROVEMENTS -	REDLAND WOODS	JONES MALTSBERGER	2007	2.516	0.839
Traffic Flow	Bexar	Shaenfield Road	Loop 1604	FM 1560	2006	0.18	0.06
Traffic Flow	Bexar	Braun Road	Loop 1604	FM 1560	2004	1.60	0.53
Traffic Flow	Bexar	Borgfeld Road	Hwy 281	Timberline	2004	2.75	0.92
Traffic Flow	Bexar	Bulverde Road	Smithson Valley	Hwy 281	2006	0.30	0.10
Traffic Flow	Bexar	Foster Road	I-10	Binz-Engleman	2004	2.16	0.72
Traffic Flow	Bexar	Kriewald Road	Hwy 90	Pue Road	2006	0.14	0.05
Traffic Flow	Bexar	Lakeview Drive	Woodlake Parkway	Foster Road	2006	0.46	0.15
Traffic Flow	Bexar	Pue Road	Kriewald Road	Sunset Place	2006	0.66	0.22
Traffic Flow	Bexar	Smith Road	Hwy 16		2006	0.90	0.30
Traffic Flow	Bexar	Wiseman Road	Loop 1604 west	Talley Road.	2004	5.35	1.78
Traffic Flow	Bexar	Woodlake Parkway	Binz-Engleman	FM 78	2006	1.58	0.53
Traffic Flow	Bexar	Applewhite Road	Watson Road	Loop 1604.	2004	9.473	3.158
TMS	TxDOT	US 90	0.8 Mi W. of IH 410	Loop 353 Nogalitos	1999	89.898	29.966
TMS	TxDOT	IH 35	Guadalupe County Line NE	1.77 KM N of FM 1976 (Frat Interchange)	2000	41.339	13.780
TMS	TxDOT	IH 36	1.77 KM N. of FM 1976 (Fratt int.)	FM 1976 (Walzem)	2000	30.396	10.132
TMS	TxDOT	IH 37	Loop 13	1.3 Mi S of US 181	2000	9.089	3.030
TMS	TxDOT	IH 410	Callaghan Road	Fredericksburg Road	2000	37.141	12.380
TMS	TxDOT	Loop 1604	0.8 KM W of Babcock Road	SH 16(N)	2000	14.741	4.914

PROJECT TYPE	AGENCY	PROJECT NAME	FROM	TO	LET DATE	VOC Lbs/day	NOx Lbs/day
ITS	TxDOT	Loop 1604	On N and S frontage roads FM 1535, E	Bitters Rd	2001	6.079	2.026
ITS	TxDOT	Loop 1604	3.21 KM E. of US 281 N.	1.61 KMN of FM 2252	1999	52.434	17.478
ITS	TxDOT	US 281	0.6 Mi N of Loop 1604	2.5 Mi N of Loop 1604	2004	26.445	8.815
TMS	TxDOT	Upgrade to 10 lane freeway and TMS	Ingram Road	Callaghan Road	2006	103.35	34.449
ITS	COSA	houston - walters to onslow	Onslow	New Braunfels	2003	2.085	0.695

Process and Methodology for Calculation of TERMs' Emission Benefits

To calculate emissions reductions due to the implementation of TERMs:

1. A list of state and federally funded roadway projects was compiled. The VIA's Park & Ride facilities were also included in this list. This list is the principal source of eligible TERMs projects.
2. A list of non-federally funded roadway projects sponsored by local governments in the region was compiled.
3. Accepted methodologies for calculating emissions reductions from mobile source control strategies published in March 2002 by TxDOT in a report entitled "The Texas Guide to Accepted Mobile Source Emission Reduction Strategies" were applied to calculate attributable emission benefits for each TERMs project for the year 2007.
4. The TERMs were divided into groups or categories and the total emissions reductions for each group/category were calculated. The following table shows creditable amount of reductions due to implementation of TERMs in the 4-county EAC region. The emissions reductions from the traffic signalization category, which are discussed in the next section, are also included in this table.

Table K-15. 2007 Emission Reduction due to the Implemented TERMs in EAC region

CATEGORY	Number of projects	2007 Emission Reduction, lbs/day	
		VOC	NOx
Intersection Improvement	13	56.44	33.86
Traffic Signalization	18*	758.54	237.44
Bike and Pedestrian Paths	97	20.57	17.34
Park & Ride Facilities	8	27.49	23.17
Grade Separation	3	39.52	23.71
Traffic Flow Improvement	188	374.32	125.67
ITS	12	564.37	188.12
Total	**339**	**1839.16**	**649.31**

* Includes traffic signalization projects evaluated in the next section, 7 projects in all.

Area of Application
The TERMs are in various locations in the 4-county EAC region. See the project list for specific locations.

Program Participants
Participants in the TERMs program are local jurisdictions and implementing agencies in the 4-county EAC region and the San Antonio-Bexar County MPO.

Expected Reductions
The expected 2007 emission reductions are 0.92 ton per day of VOC and 0.33 ton per day of NOx.

Emission Reduction Estimates from Traffic Signalization

Background

Aside from traffic signalization projects shown in the TERMs project list in the previous pages, certain traffic signals for various intersections in the Bexar County have been separately evaluated for their impacts on the air quality. The bases for this evaluation are the findings that "Pape-Dawson Engineering, Inc", a consultant for the San Antonio MPO, has presented in its 2001 report on 7 traffic signal re-timing projects. The emissions reductions due to traffic signal re-timing, which are calculated in this evaluation and included in the Table K-15 amounted to 748.18 lbs/day of VOC and 230.36 lbs/day of NOx. These reductions would provide additional evidence indicating future lower ozone levels for the San Antonio area. In the following pages, the studied intersections are identified and this evaluation is described.

Introduction

Traffic flow improvements have been used for air quality planning due to their ability to reduce traffic congestion, reducing congestion-related emissions, and are also a cost-effective method of reducing congestion and emissions.[9] Arterial management systems manage traffic by employing various detection and control devices along arterial roadways.

Traffic signalization is one of the most common traffic management techniques utilized in the United States. Signal control systems are methods of arterial roadway management is practiced because such control systems improve traffic flow as well as simplify system maintenance.[10] Some improvements can include:
Updating traffic signal hardware to utilize more modern technology, allowing for more sophisticated traffic flow strategies to be planned;
Timing traffic signals to correspond with current traffic flows, reducing unnecessary delays;
Coordinating and interconnecting signals to better interface pre-timed and traffic actuated signals, actively managed timing plans, and master controllers to minimize the number and frequency of stops necessary at intersections; and
Removing signals at intersections no longer requiring signalized stop control to reduce vehicle delays and unwarranted stops on the major street.[9]

The use of flexible traffic signal systems has been used since the early 1960's when computerized systems began to come into existence. Signalization projects can reduce carbon monoxide (CO) and hydrocarbon (HC) by reducing the number of vehicular stops and idling, which would reduce travel times and traffic delays. Reductions in fuel consumption have also been observed through traffic signal re-timing. Traffic flow at intersections can be improved in interconnection and coordination of signals.

Resignalization in Bexar County

The prospect of traffic signal retiming has been evaluated for various intersections in Bexar County in order to efficiently deal with the existing levels of traffic volumes. A program was recently conducted for Bexar County, as it is recommended that traffic signal timing patterns be checked and updated every 5 to 7 years. Such programs focus

[9] MOSERS Handbook, June 2003. Texas Department of Transportation
[10] Miretek Systems, "Intelligent Transportation Systems Benefits: 2001 Update." Federal Highway Administration, June 2001.

on three factors: 1) public benefit from improved traffic operation, 2) the inherent cost-effectiveness of operations improvements, and 3) establishing a baseline for measuring effectiveness in future re-timing projects.

Approximately seven traffic signal systems were assessed as to their benefit and functionality in handling traffic volume within the San Antonio area. The following table lists the systems that were analyzed during the months of May 2001 to November 2001.

Table K-16. Traffic Signal Systems Evaluated

Traffic Signal Systems	
Wetmore System	Bandera System
Jones Maltsberger System	Rittiman System
Bitters/West System	Nacogdoches/Perrin Beitel System
Eisenhauer System	

Traffic Signal Evaluation

The evaluation of the selected traffic signal systems involved several steps. Traffic light systems in the San Antonio area were evaluated bv Pape-Dawson Engineers, Inc. The evaluation involved collection of data, design improvements, optimal timing plan development and implementation, and simulation of before and after conditions. Several models were used in the evaluation and assessment of the traffic signal systems. These models included TRANSYT-7F, Synchro 3.2, and PASSER II.

Information on arterial data, "before" signal timing data, saturation flow rates, and speed/travel time data were gathered through various sources. Traffic volumes, which are the numbers of vehicles that pass a specific point during a given period of time, were collected at the intersections.[11] Lane configuration, link speed data, and link distance information were provided by the City of San Antonio. The data gathered for model input was first run through Synchro 3.2 to produce a simulation file. The file was calibrated to reflect specific "before" conditions and then converted to a TRANSYT-7F file. The TRANSYT-7F analyzed the traffic system and produced a "before" traffic flow simulation.

The simulation data originally provided by Synchro 3.2 was then modified to reflect optimal time cycles for improved efficiency. PASSER II analyzed alternative phasing arrangements and cycle lengths. The cycle lengths that generated the least amount of delay were deemed most efficient and thus recommended. The following sections describe the arterial intersections that were analyzed and the recommended timing plans.

Wetmore System

The Wetmore System is located on Wetmore Road, which is classified as a primary arterial, Type A. In evaluating this system, three timing plans were developed for the

[11] "Detection Technology: For IVHS-Volume 1: Final Report Addendum." July 1995. http://ntl.bts.gov/DOCS/96100/ch02/body_ch02_03.html

A.M Peak, Midday/Off Peak, and P.M. Peak periods. Four intersections were analyzed on the Wetmore System and their operation is detailed in the following table.[12]

Table K-17. Intersections Evaluated for Traffic Signal Re-Timing on Wetmore Rd.

Signalization Details		
Before Conditions		
Intersection Name	Operation	No. of Phases
Wetmore Rd. & Ridge Country	Coordinated	4
Wetmore Rd. & Gunn Sports Park	Coordinated	4
Wetmore Rd. & Wurzbach Pkwy West	Coordinated	4
Wetmore Rd. & Wurzbach Pkwy East	Coordinated	4
After Conditions		
Intersection Name	Operation	No. of Phases
Wetmore Rd. & Ridge Country	Coordinated	4
Wetmore Rd. & Gunn Sports Park	Coordinated	4
Wetmore Rd. & Wurzbach Pkwy West	Coordinated	4
Wetmore Rd. & Wurzbach Pkwy East	Coordinated	4

The Wetmore System was evaluated as described in Traffic Signal Evaluation. Analysis of the evaluation provided cycles that would improve efficiency in a number of areas. These areas include bandwidth efficiency, vehicle delay, and fuel consumption.

The 115 second cycle for the AM peak hour was selected since it provided the best bandwidth efficiency, largest bands for northbound and southbound traffic, and had a lower delay value. The 75 second cycle for off peak hours is the lowest delay for the arterial. The 80 second cycle for the PM peak hour had a high bandwidth efficiency, lowest delay, and the lowest fuel consumption.

Eisenhauer System

The Eisenhauer System is located on Eisenhauer Road and is designated as a secondary arterial, Type A, east of Interstate 35 and Type B, west of Interstate 35. Three timing plans were developed for the A.M. Peak, Midday/Off Peak, and P.M. Peak periods. Nine intersections were evaluated, as listed in the following table.[13]

Table K-18. Evaluated Intersections on Eisenhauer Rd

Signalization Details		
Before Conditions		
Intersection Name	Operation	No. of Phases
Eisenhauer and Corrine	Uncoordinated	2
Eisenhauer and Holbrook	Uncoordinated	2
Eisenhauer and Harlow	Uncoordinated	2

[12] Traffic Signal Re-Timing Study, "Wetmore System Technical Memorandum." Pape Dawsom Engineers, May 2001.

[13] Traffic Signal Re-Timing Study, "Eisenhauer System Technical Memorandum." Pape Dawsom Engineers, November 2001.

Eisenhauer and Kingston	Uncoordinated	2
Eisenhauer and Molokai	Uncoordinated	2
Eisenhauer and Interstate 35 Diamond	Uncoordinated	TTI 4 Phase
Eisenhauer and Fratt	Uncoordinated	5
Eisenhauer and Ray Bon	Uncoordinated	8
Eisenhauer and Mid Crown	Uncoordinated	6
After Conditions		
Intersection Name	Operation	No. of Phases
Eisenhauer and Corrine	Coordinated	2
Eisenhauer and Holbrook	Coordinated	2
Eisenhauer and Harlow	Coordinated	2
Eisenhauer and Kingston	Coordinated	2
Eisenhauer and Molokai	Coordinated	2
Eisenhauer and Interstate 35 Diamond	Coordinated	TTI 4 Phase
Eisenhauer and Fratt	Coordinated	5/2
Eisenhauer and Ray Bon	Coordinated	8/2
Eisenhauer and Mid Crown	Coordinated	6/2

The Eisenhauer System was evaluated as described in Traffic Signal Evaluation. Analysis of the evaluation provided cycles that would improve efficiency in a number of areas. These areas include bandwidth efficiency, vehicle delay, and fuel consumption. The AM peak hour's cycle was chosen to be 120 seconds since it provided the best bandwidth efficiency and largest bands for northbound and southbound traffic. The cycle also coincided with low values of delay and low fuel consumption. The 90 second cycle was recommended for the system during off peak hours. This cycle provided the lowest delay at the I-35 diamond interchange.

Bitters/West System

The Bitters/West System is located on Bitters Road and West Avenue. Bitters Road is a Type A secondary arterial. West Avenue is a Type A arterial and meets Bitters. Three timing plans were developed for the A.M. Peak, Midday/Off Peak, and P.M. Peak periods. Six intersections were evaluated, as listed in the following table.[14]

Table K-19. Intersections Evaluated for Traffic Signal Re-Timing on Bitters/West

Signalization Details		
Before Conditions		
Intersection Name	Operation	No. of Phases
Bitters Road and Heimer Road	Uncoordinated	7
Bitters Road and US 281	Uncoordinated	TTI 4 Phase
Bitters Road and Embassy Row	Uncoordinated	4
Bitters Road and West Avenue	Uncoordinated	5
West Avenue and Embassy Oaks	Uncoordinated	2

[14] Traffic Signal Re-Timing Study, "Bitters/West System Technical Memorandum." Pape Dawsom Engineers, October 2001.

West Avenue and Interpark Blvd	Uncoordinated	4
After Conditions		
Intersection Name	Operation	No. of Phases
Bitters Road and Heimer Road	Uncoordinated	7
Bitters Road and US 281	Uncoordinated	TTI 4 Phase
Bitters Road and Embassy Row	Uncoordinated	4
Bitters Road and West Avenue	Uncoordinated	5
West Avenue and Embassy Oaks	Uncoordinated	2
West Avenue and Interpark Blvd	Uncoordinated	4

The Bitters/West System was evaluated as described in Traffic Signal Evaluation. Analysis of the evaluation provided cycles that would improve efficiency in a number of areas. These areas include bandwidth efficiency, vehicle delay, and fuel consumption.

The best cycle for the A.M. peak hour was 108 seconds. It provided the best bandwidth efficiency and low delay. A cycle length of 90 seconds for off peak hours yielded low delay but were the lowest in effectiveness of all categories. For P.M. peak hours, the 120 second cycle length provided high bandwidth efficiency, low fuel consumption, and low delay values.

Bandera System

The Bandera System is on Bandera Road, which is designated as a primary arterial, Type A. The lanes on Bandera Road vary from six-lanes with exclusive left turn lanes to a four-lane roadway with exclusive right and left turn lanes. Three timing plans were developed for the A.M. Peak, Midday/Off peak, and P.M. Peak periods. Eight intersections were evaluated on Bandera Road, as listed in the following table.[15]

Table K-20: Intersections Evaluated for Traffic Signal Re-Timing on Bandera Rd

Signalization Details		
Before Conditions		
Intersection Name	Operation	No. of Phases
Bandera and Prue/Tezel	Coordinated	6
Bandera and Old Prue/Camino Villa	Coordinated	6
Bandera and Braun	Coordinated	5
Bandera and Mystic Park/Bresnahan	Coordinated	6
Bandera and Guilbeau/Bristle Cone	Coordinated	6
Bandera and Mainland	Coordinated	6
Bandera and Eckhert	Coordinated	6
Gilbeau and Mystic Park	Free/Coordinated	3
After Conditions		
Intersection Name	Operation	No. of Phases
Bandera and Prue/Tezel	Coordinated	6
Bandera and Old Prue/Camino Villa	Coordinated	6
Bandera and Braun	Coordinated	5

[15] Traffic Signal Re-Timing Study, "Bandera System Technical Memorandum." Pape Dawsom Engineers, June 2001.

Bandera and Mystic Park/Bresnahan	Coordinated	6
Bandera and Guilbeau/Bristle Cone	Coordinated	6
Bandera and Mainland	Coordinated	6
Bandera and Eckhert	Coordinated	6
Gilbeau and Mystic Park	Coordinated	3

The Bandera System was evaluated as described in Traffic Signal Evaluation. Analysis of the evaluation provided cycles that would improve efficiency in a number of areas. These areas include bandwidth efficiency, vehicle delay, and fuel consumption.

For the A.M. peak hour, a cycle of 130 seconds was chosen due to good bandwidth efficiencies. The 90 second cycle was recommended for off peak hours since it provided a low delay time. The P.M. peak hour was recommended the 130 second cycle length due to high bandwidth efficiency, low delay, and low fuel consumption.

Rittiman System

Rittiman Road is designated a secondary arterial, Type A east of I-35 and Type B, west of I-35. Rittiman road is a four lane roadway with a diamond interchange at the intersection with Interstate 35. Three timing plans were developed for the A.M. Peak, Midday/Off peak, and P.M. Peak periods. Table K-21 lists the five intersections that were evaluated on this system.[16]

Table K-21. Intersections Evaluated for Traffic Signal Re-Timing on Rittiman

Signalization Details		
Before Conditions		
Intersection Name	Operation	No. of Phases
Rittiman Rd and Rittiman Plaza	Uncoordinated	2
Rittiman Rd and Fairdale	Uncoordinated	2
Rittiman Rd and IH 35 Diamond	Uncoordinated	TTI 4 Phase
Rittiman Rd and Goldfield	Uncoordinated	2
Rittiman Rd and Fratt/Business Park	Uncoordinated	8
After Conditions		
Intersection Name	Operation	No. of Phases
Rittiman Rd and Rittiman Plaza	Coordinated	2
Rittiman Rd and Fairdale	Coordinated	2
Rittiman Rd and IH 35 Diamond	Coordinated	TTI 4 Phase
Rittiman Rd and Goldfield	Coordinated	2
Rittiman Rd and Fratt/Business Park	Coordinated	8

The Rittiman System was evaluated as described in Traffic Signal Evaluation. Analysis of the evaluation provided cycles that would improve efficiency in a number of areas. These areas include bandwidth efficiency, vehicle delay, and fuel consumption.

For the A.M. peak hour, the 120 second cycle was bandwidth efficient and had the lowest delay values. The 90 second cycle for the off peak period allows low delay at the

[16] Traffic Signal Re-Timing Study, "Rittiman System Technical Memorandum." Pape Dawsom Engineers, November 2001.

diamond interchange as well as along the arterial. The 120 second cycle was also recommended for the PM peak hour due to it high bandwidth efficiency, low delay, and low fuel consumption.

Jones-Maltsberger System

Jones-Maltsberger is a secondary arterial, Type A and has four lanes. Three timing plans were developed for the A.M. Peak, Off Peak, and P.M. Peak periods. Five intersections were evaluated on Jones-Maltsberger, which are listed on Table K-22.[17]

Table K-22. Intersections Evaluated for Traffic Signal Re-Timing on Jones-Maltsberger

Signalization Details		
Before Conditions		
Intersection Name	Operation	No. of Phases
Jones Maltsberger and Starcrest	Free	8
Jones Maltsberger and Perennial/Budding	Free	6
Jones Maltsberger and Money Tree	Free	5
Jones Maltsberger and Burning Trail	Free	5
Jones Maltsberger and Thousand Oaks	Free	8
After Conditions		
Intersection Name	Operation	No. of Phases
Jones Maltsberger and Starcrest	Coordinated	8
Jones Maltsberger and Perennial/Budding	Coordinated	6
Jones Maltsberger and Money Tree	Coordinated	5
Jones Maltsberger and Burning Trail	Coordinated	5
Jones Maltsberger and Thousand Oaks	Coordinated	8

The Jones-Maltsberger System was evaluated as described in Traffic Signal Evaluation. Analysis of the evaluation provided cycles that would improve efficiency in a number of areas. These areas include bandwidth efficiency, vehicle delay, and fuel consumption.

The best cycle for the A.M. peak period was one that consisted of 90 seconds since it had the best bandwidth efficiency and low delay. A cycle of 120 seconds was optimal for off peak. A good candidate for the P.M. peak period would be a cycle of 115 seconds since it had good bandwidth efficiency, low fuel consumption, and low delay values.

Nacogdoches/Perrin Beitel System

Both Nacogdoches and Perrin Beitel are Type A secondary arterial, each being a four-lane roadway. Twenty intersections were evaluated on the Nacogdoches/Perrin Beitel system, as detailed on Table K-23. Three timing plans were developed for the A.M. Peak, Off Peak, and P.M. Peak periods.[18]

[17] Traffic Signal Re-Timing Study, "Jones-Maltsberger System Technical Memorandum." Pape Dawsom Engineers, May 2001.

[18] Traffic Signal Re-Timing Study, "Nacogdoches/Perrin Beitel System Technical Memorandum." Pape Dawsom Engineers, November 2001.

Table K-23: Intersections Evaluated for Traffic Signal Re-Timing on Nacogdoches/Perrin Beitel

Signalization Details		
Before Conditions		
Intersection Name	Operation	No. of Phases
Nacogdoches and Topperwien	Coordinated	4
Nacogdoches and Judson	Coordinated	8
Nacogdoches and Dreamwood	Coordinated	3
Nacogdoches and O'Connor	Coordinated	8
Nacogdoches and El Charro	Coordinated	2/3*
Nacogdoches and Higgins	Coordinated	3
Nacogdoches and El Sendero	Coordinated	4
Nacogdoches and Bell	Coordinated	3
Nacogdoches and Leonhardt	Coordinated	5
Nacogdoches and Thousand Oaks	Coordinated	8
Perrin Beitel and Naco-Perrin	Coordinated	6
Perrin Bietel and El Sendero	Coordinated	3
Perrin Beitel and Wurzbach Parkway	Coordinated	TTI 4 Phase
Perrin Beitel and Perrin Central	Coordinated	5
Perrin Beitel and Post Office	Coordinated	3
Perrin Beitel and Clear Spring	Coordinated	3
Perrin Beitel and Comstock	Coordinated	5
Perrin Beitel and Center Gate	Coordinated	3
Thousand Oaks and Bulverde	Coordinated	5
Thousand Oaks and Uhr	Coordinated	2
After Conditions		
Intersection Name	Operation	No. of Phases
Nacogdoches and Topperwien	Coordinated	4
Nacogdoches and Judson	Coordinated	8
Nacogdoches and Dreamwood	Coordinated	3
Nacogdoches and O'Connor	Coordinated	8
Nacogdoches and El Charro	Coordinated	2/3*
Nacogdoches and Higgins	Coordinated	3
Nacogdoches and El Sendero	Coordinated	4
Nacogdoches and Bell	Coordinated	3
Nacogdoches and Leonhardt	Coordinated	5
Nacogdoches and Thousand Oaks	Coordinated	8
Perrin Beitel and Naco-Perrin	Coordinated	6
Perrin Beitel and El Sendero	Coordinated	3
Perrin Beitel and Wurzbach Parkway	Coordinated	TTI 4 Phase
Perrin Beitel and Perrin Central	Coordinated	5
Perrin Beitel and Post Office	Coordinated	3
Perrin Bietel and Clear Spring	Coordinated	3
Perrin Beitel and Comstock	Coordinated	5
Perrin Beitel and Center Gate	Coordinated	3
Thousand Oaks and Bulverde	Coordinated	5
Thousand Oaks and Uhr	Coordinated	2

The Nacogdoches/Perrin Beitel System was evaluated as described in Traffic Signal Evaluation. Analysis of the evaluation provided cycles that would improve efficiency in a number of areas. These areas include bandwidth efficiency, vehicle delay, and fuel consumption.

The 90 second cycle for the AM peak hour was selected since it provided the one of the best bandwidth efficiencies, large bands for northbound and southbound traffic, and lowest combination of delay values. Off peak period was recommended the 90 second cycle. It presented the lowest delay and low fuel consumption. The 130 second cycle length for PM peak hour had high bandwidth efficiency, low delay, and low fuel consumption.

In summary, the traffic signal systems included in this study were recommended to have cycle lengths reduced while maintaining efficient bandwidth, reduced vehicle delays, and reduced fuel consumption. The following table details the various traffic signal systems included in the study as well as data on vehicle stop frequency, vehicle delay, and fuel consumption.

Table K-24. Traffic Signal System Statistics before & with Recommended Improvements

Traffic Signal System		Number of Hours	Stops		Total System Delay		Fuel Consumption	
			Before	After	Before	After	Before	After
Wetmore	AM	2.33	7814	6244	61	37	221	190
	Off Peak	7.5	3040	2550	20	14	105	94
	PM	2	4471	4510	32	26	166	160
Eisenhauer	AM	2	17195	14734	677	525	773	655
	Off Peak	7	13207	2787	112	24	331	81
	PM	2	18224	14552	543	384	725	585
Bitters/West	AM	2	16464	12664	329	281	454	431
	Off Peak	7	14761	15872	613	472	620	600
	PM	2	40344	22853	2463	868	2065	979
Bandera	AM	1.25	31743	24221	834	724	1474	1300
	Off Peak	6.5	17108	14290	132	110	732	624
	PM	3.75	60293	29076	3640	738	3625	1406
Rittiman	AM	2	19116	11822	702	412	1192	552
	Off Peak	7	7048	5270	55	40	222	203
	PM	2	17651	15939	1380	663	1295	759
Jones-Maltsberger	AM	2	8356	8069	82	66	381	334
	Off Peak	7	6697	6168	71	64	314	283
	PM	2	14926	11797	246	175	596	487
Nacogdoches/Perrin Beitel	AM	1.5	25721	22211	201	179	834	783
	Off Peak	7	23273	21934	163	157	801	785
	PM	3	47198	37977	793	760	1626	1513

On-Road Emission Reduction

According to the 1999 AACOG Emission Inventory, on-road source provides substantial amounts of VOC and NOx emissions to Bexar County. The 2007 projection of the September photochemical modeling episode accounts for the updated MOBILE6 on road emissions and it is against these emissions that the proposed traffic signal timing cycle improvements were performance evaluated. Average weekday (Monday-Friday) emissions for on-road source in Bexar County are 61 tons/day of NOx and 49 tons/day of VOC[19].

The "Traffic Signal Re-Timing Study"[20] reports describing the evaluations and timing cycle recommendations of the traffic signal systems were not consistent in detailing correct delay values and provided confusing details. The purpose of this report was to

[19] See Chapter 4 for the methodology to calculate on-road emissions in 2007 projection and Table k- 4.3 and 4.4 for complete on-road emission data.

[20] "Traffic Signal Re-Timing Study," Pape Dawson Engineers Inc. May 2001-November 2001.

evaluate the proposed signal timing improvements for the areas under study as well as their potential emission reduction. It was concluded after much analysis that analyzing the increase or decrease of total delay time the vehicles experienced during the before and after traffic flow simulations would be the more suitable approach. The difference of the total delay times was multiplied by an emission factor for idling vehicles.

The idling emission factor was utilized since vehicles idle while being delayed at traffic light stops. MOBILE6 provided the emission factor for a vehicle speed of 2.5 miles per hour. A speed of 2.5 miles per hour was used because it was the slowest speed for which the mobile6 model can calculate emission factors. For all the other factors for the mobile6 model (temperature, RVP and Sulfur levels, VMT Mix, etc.) the local data were used as input[21]. The idling emission factor for VOC was 7.03 grams/mile and for NOx it was 2.17 grams/mile.
Once the idling emission factors were estimated, the result was applied to each intersection. The equation for calculating emissions reductions per hour is:

(Total Delay Time Before per hour – Total Delay Time After per hour) x Mobile6 Idling Emission Factor = Emission Reductions per hour

The delay times were evaluated for 3 time periods: AM Peak, PM Peak, and Off Peak. The AM peak, PM peak, and Off Peak hours varied for each traffic signal system. For example, AM peak periods varied between 1.25 hours and 3.75 hours. These time frames are listed in Table K-24 for each intersection involved in the study. The emissions (grams/hr) were multiplied by the number of hours in the respective time period to result in the total emission reduction per time period. The total emissions in grams/day were then converted to pounds/day.

(Total Emissions grams/day x 2.205) /1000 = Total Emissions lbs/day

The following tables and figures illustrate the emission reductions for the traffic signal systems with the implementation of recommended timing cycles.

Wetmore System Emission Reductions

AM peak period reductions were significant on a per hour scale than the off peak period reductions for the Wetmore system. An average reduction of 1.1 lbs/hr was observed in the AM peak hours compared to an average of 0.2 lbs/hr of VOC idling emissions was reduced in the off peak hours by the recommended timing plans.

PM peak only had an emissions reduction of approximately 0.24 lbs/hr. The PM period for idling NOx emissions had the most significant emission reduction of the periods included in the study, based per hour. The PM peak period had a reduction of 0.72 lbs/hr while the AM peak period had a reduction of 0.33 lbs/hr and the off peak period had a reduction of 0.08 lbs/hr.
The following tables list the emissions reductions by time period, while figures K-1 and K-2 graphically compare the before and after case. Overall VOC emissions decrease 4 lbs/day and NOx emissions decreased 1.3 lbs/day. This system had the smallest reduction in VOC and NOx emissions among the seven systems analyzed.

[21] See UPWP 3.8, 2003 “Analysis of On-Road Control Strategies and Alternative Fuels for San Antonio Metropolitan Statistical Area September 13-20, 1999 Modeling Episode” (unpublished report) for a complete description of the Moble6 model and the data inputs used.

Table K-25. Idling VOC and NOx Emission for the Wetmore Traffic System, lbs/day

Time Period	VOC		NOx		Percent Change (VOC&NOx)
	Before	After	Before	After	
AM Peak	5.51	3.34	1.70	1.03	-39.33%
Off Peak	5.81	4.07	1.79	1.25	-30.00%
PM Peak	2.48	2.02	0.76	0.62	-18.72%
Total	13.80	9.43	4.25	2.90	-31.69%

Figure K-1. Idling VOC Emissions before and after New Timing Cycle Implementation on the Wetmore System

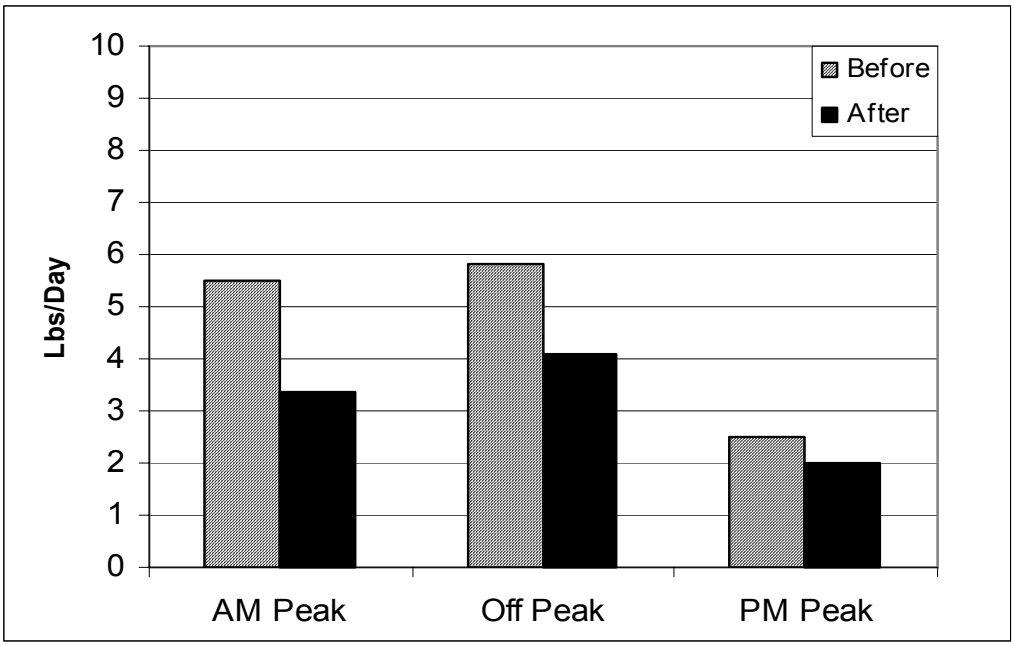
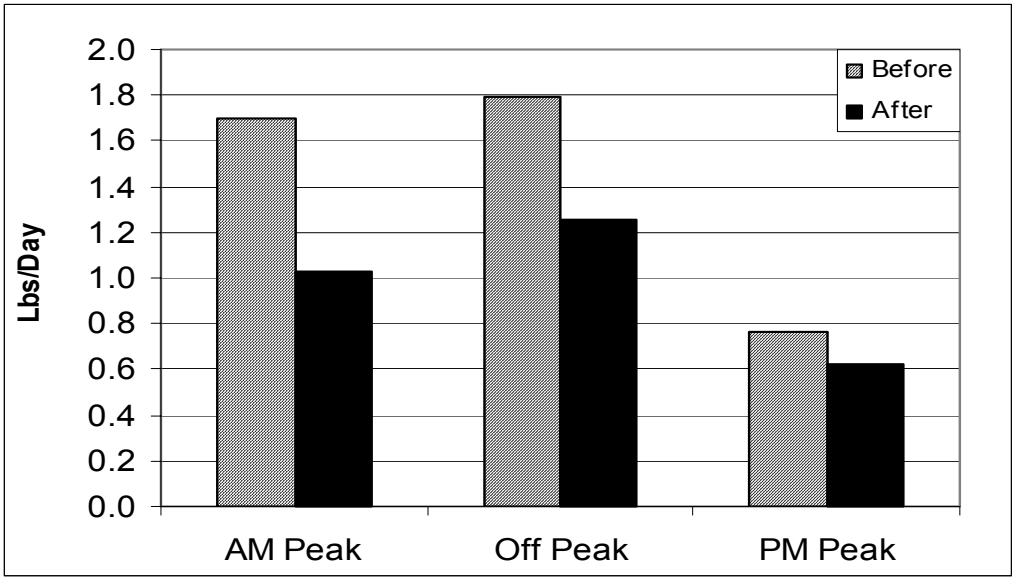


Figure K-2. Idling NOx Emissions before and after New Timing Cycle Implementation on the Wetmore System



Eisenhauer System Emissions Reductions

The recommended timing cycles for the Eisenhauer traffic signal system provided a constant reduction in idling VOC emissions. The AM peak, off peak, and PM peak idling VOC emission reduction on a per hour basis is about 6 lbs/hr. The cycles reduced idling NOx emissions at almost the same constancy as the idling VOC reductions, reducing AM peak and PM peak idling NOx emission reductions by about 2 lbs/hr and off peak idling NOx emission reduction by 1 lb/hr.

Figures K-3 and K-4 provide VOC and NOx bar charts of the before and after the traffic re-signalization. Compared to the Off-Peak time of the other traffic light systems, this system had the greatest percentage reductions for the off peak period.

Table K-26. Idling VOC and NOx Emissions for the Eisenhauer Traffic Signal System, lbs/day

Time Period	VOC		NOx		Percent Change (VOC&NOx)
	Before	After	Before	After	
AM Peak	52.48	40.70	16.16	12.53	-22.45%
Off Peak	30.39	6.51	9.36	2.01	-78.57%
PM Peak	42.09	29.77	12.96	9.17	-29.28%
Total	124.96	76.98	38.47	23.70	-38.40%

Figure K-3. Idling VOC Emissions before and after New Timing Cycle Implementation on the Eisenhauer System

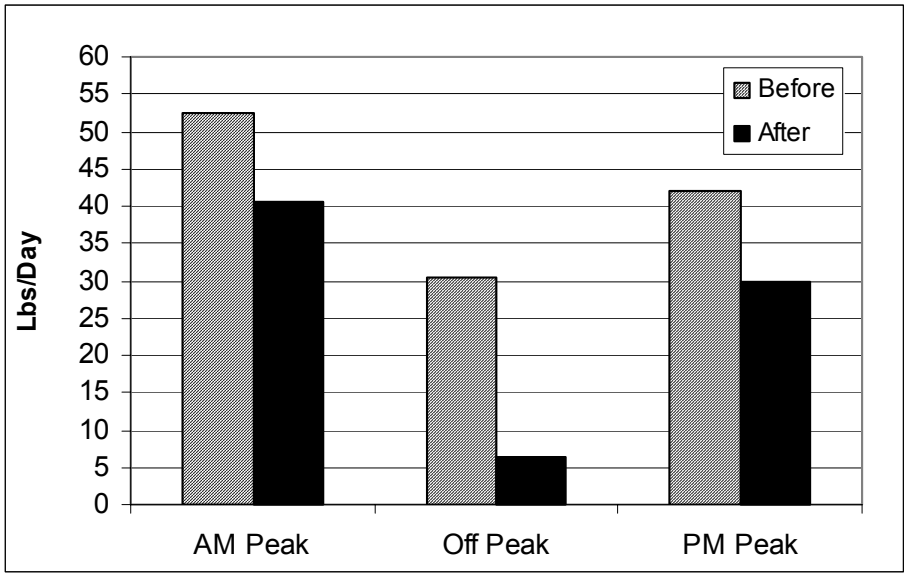
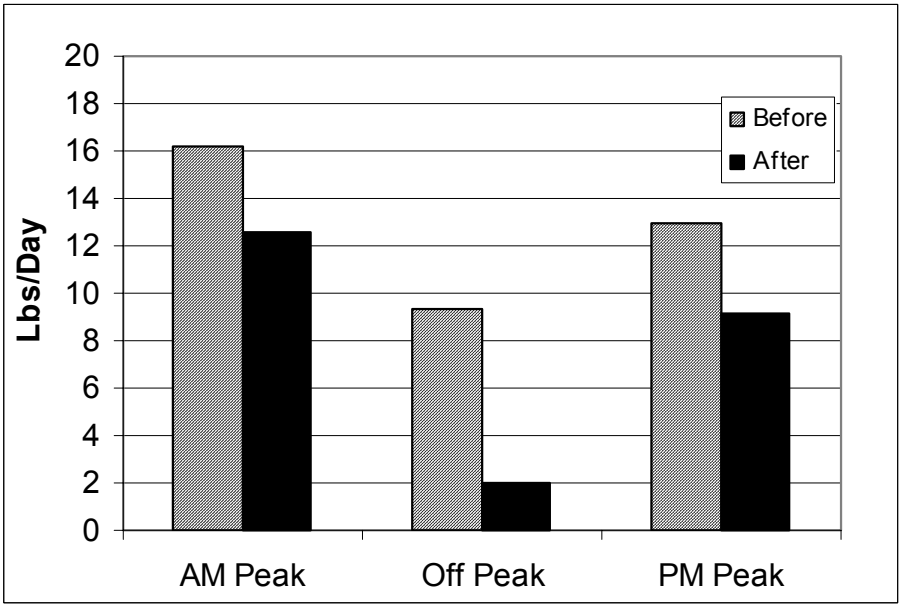


Figure K-4. Idling NOx Emissions before and after New Timing Cycle Implementation on the Eisenhauer System



Bitters/West Emission Reduction

The recommended timing cycles for the Bitters/West system reduced emissions during the time periods under study, with some reductions being more than others. Idling VOC emissions during the AM peak period were reduced on average by 2 lbs/hr. Off peak idling VOC emissions were reduced by 6 lbs/hr and PM peak idling VOC emissions were

reduced by approximately 60 lbs/hr. Regarding reductions in idling NOx emissions, emissions were reduced in all three time periods with PM reductions being more significant than the other two periods. Idling NOx emissions were reduced by about 0.5 lbs/hr during the AM peak period and 2 lbs/hr during the off peak period. The idling NOx emission reduction during the PM peak period was observed at 19 lbs/hr.

As listed in Table K-27, overall VOC emissions were reduced by 166 lbs/day and NOx emissions were reduced 51 lbs/day. This represents the second greatest total reduction of all the single systems studied. The results are graphically display in Figures K-5 and K-6.

Table K-27. Idling VOC and NOx Emission for the Bitters/West Traffic Signal System, lbs/day

Time Period	VOC		NOx		Percent Change (VOC&NOx)
	Before	After	Before	After	
AM Peak	25.50	21.78	7.85	6.71	-14.58%
Off Peak	166.32	128.06	51.21	39.43	-23.00%
PM Peak	190.93	67.29	58.79	20.72	-64.76%
Total	382.76	217.14	117.85	66.85	-43.27%

Figure K-5. Idling VOC Emissions before and after New Timing Cycle Implementation on the Bitters/West System

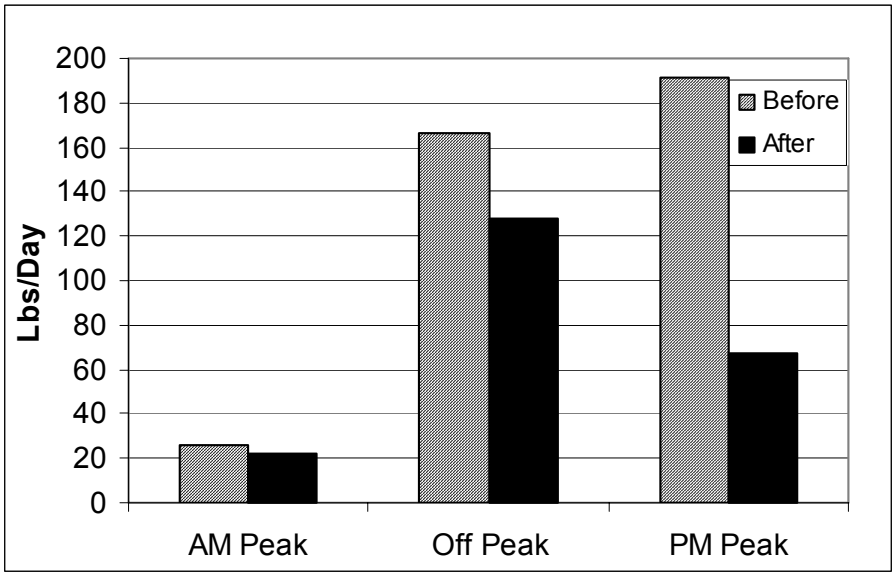
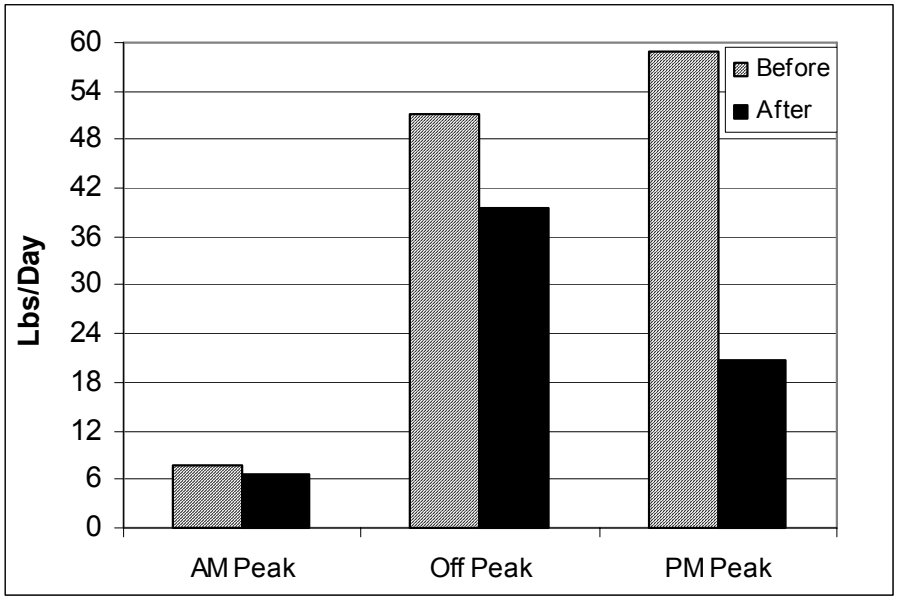


Figure K-6. Idling NOx Emissions before and after New Timing Cycle Implementation on the Bitters/West System



Bandera Emission Reduction

The timing cycle implemented on the Bandera traffic system reduced idling emissions. The emission reduction of idling VOC precursors was 1 lb/hr and 2 lbs/hr during the off peak period and AM peak period, respectively. The idling emission reduction for the PM peak period is significantly higher with a reduction of 200 lbs/hr.

Listed in Table K-28 are the VOC and NOx emissions reductions for each other the three time periods for this system. As expected, this intersection had the greatest reduction in VOC (433lbs) and NOx (133lbs) emissions. This system also had the highest percentage reduction in emissions too. The dramatic drops in emissions are shown in figures K-7 and K-8.

Table K-28. Idling VOC and NOx Emissions for the Bandera Traffic Signal System, lbs/day

Time Period	VOC		NOx		Percent Change (VOC&NOx)
	Before	After	Before	After	
AM Peak	40.41	35.08	12.44	10.80	-13.19%
Off Peak	33.26	27.71	10.24	8.53	-16.66%
PM Peak	529.08	107.27	162.90	33.03	-79.73%
Total	602.74	170.06	185.58	52.36	-71.79%

Figure K-7. Idling VOC Emissions before and after New Timing Cycle Implementation on the Bandera System

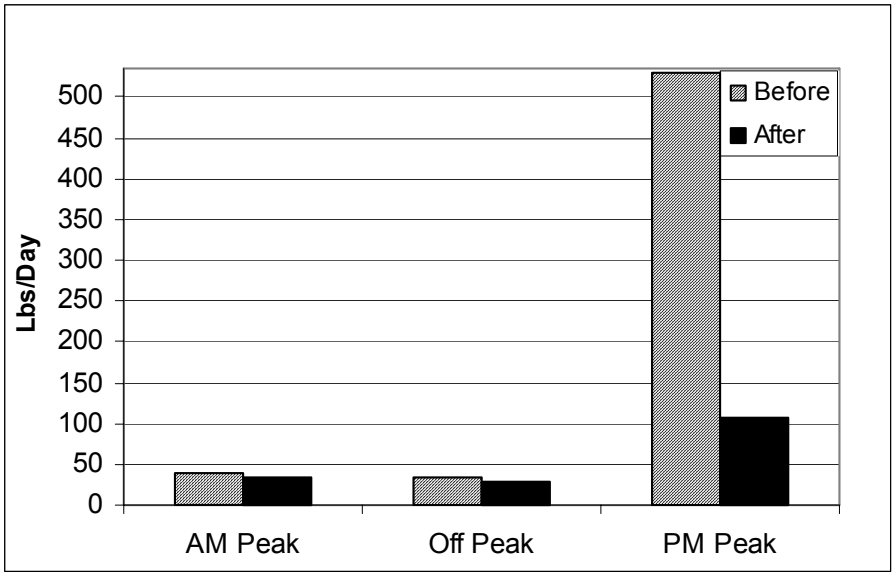
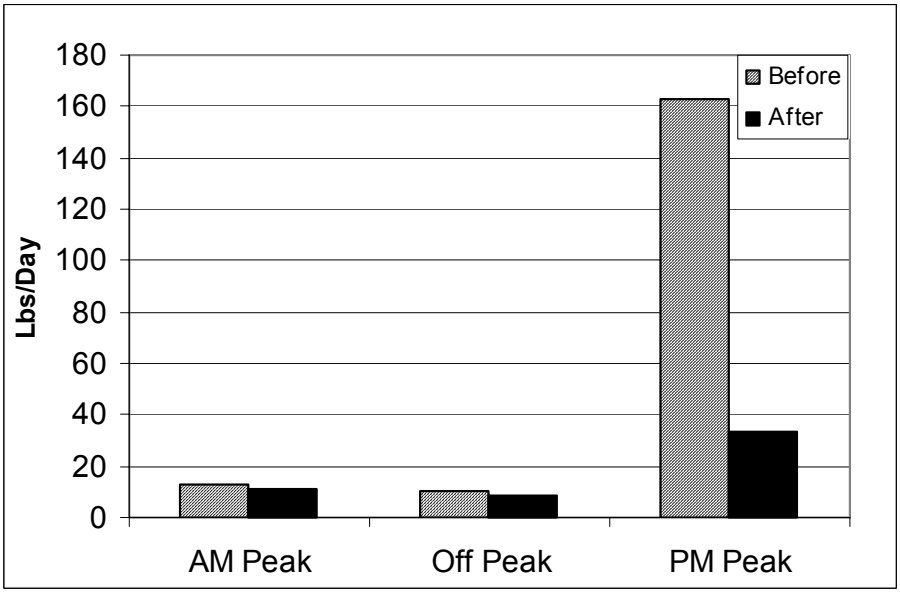


Figure K-8. Idling NOx Emissions before and after New Timing Cycle Implementation for the Bandera System



Rittiman Emission Reduction

For the Rittiman traffic signal system, VOC and NOx emission reductions are significant during the PM peak hour periods than the AM peak periods or the off peak periods. The VOC reduction for the PM peak period was 27 pounds per hour. The AM peak had a VOC reduction of 11 pounds per hour and off peak had a reduction of 0.5 pound per hour. NOx emissions were reduced by 8 pounds per hour during the PM peak period. The AM peak period had a reduction of 3.5 pounds per hour and the off peak period had a reduction of 0.2 pound per hour.

Overall, there were reductions of 82 lbs of VOC and 25 lbs of NOx (Table K-29). This represented the second highest overall percentage reduction at 47%. Figures K-9 and K-10 graphically display the results for VOC and NOx reductions.

Table K-29. Idling VOC and NOx Emission Reductions for the Rittiman Traffic Signal System, lbs/day

Time Period	VOC		NOx		Percent Change (VOC&NOx)
	Before	After	Before	After	
AM Peak	54.42	31.94	16.76	9.83	-41.31%
Off Peak	14.92	10.85	4.60	3.34	-27.29%
PM Peak	106.98	51.40	32.94	15.82	-51.96%
Total	176.32	94.19	54.29	29.00	-46.58%

Figure K-9. Idling VOC Emissions before and after New Timing Cycle Implementation on the Rittiman System

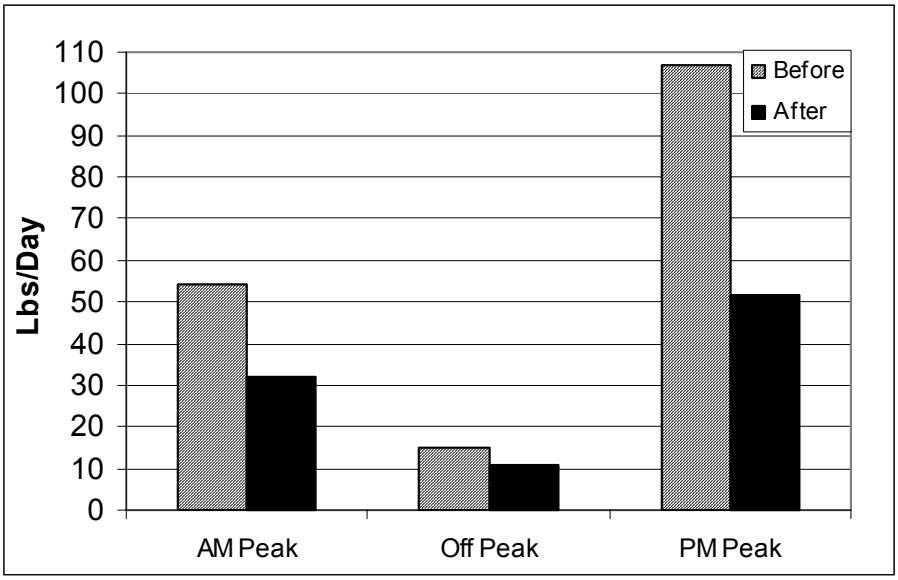
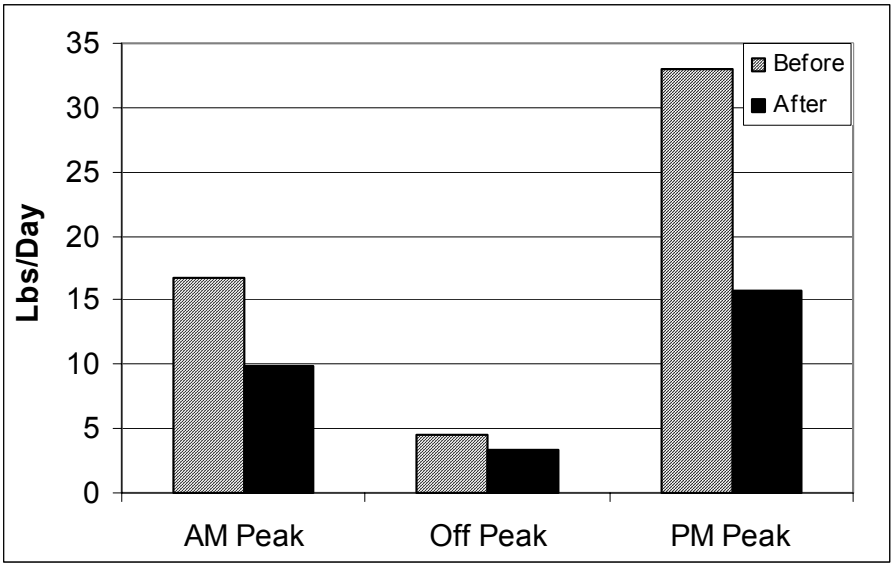


Figure K-10. Idling NOx Emissions before and after New Timing Cycle Implementation for the Rittiman System



Jones-Maltsberger Emission Reduction

Minimal emission reduction was evident once the recommended timing cycles were modeled for the Jones Maltsberger traffic signal system (Table K-30). The AM peak period had a VOC emission reduction of 0.6 pounds per hour and a NOx emission reduction of 0.2 pound per hour. An emission reduction of 3 pounds per hour in VOC emissions and 0.8 pound per hour in NOx emissions was noted for their PM peak period. The off peak period had an emission reduction of 0.3 pound per hour of VOC emissions and 0.1 pound per hour of NOx emissions. Figures K-11 and K-12 shows the emissions reductions by time period in bar graph format.

Table K-30. Idling VOC and NOx Emissions for the Jones Maltsberger Traffic Signal System, lbs/day

Time Period	VOC		NOx		Percent Change (VOC&NOx)
	Before	After	Before	After	
AM Peak	6.36	5.12	1.96	1.58	-19.52%
Off Peak	19.26	17.37	5.93	5.35	-9.86%
PM Peak	19.07	13.57	5.87	4.18	-28.85%
Total	44.69	36.05	13.76	11.10	-19.34%

Figure K-11. Idling VOC Emissions before and after New Timing Cycle Implementation on the Jones Maltsberger System

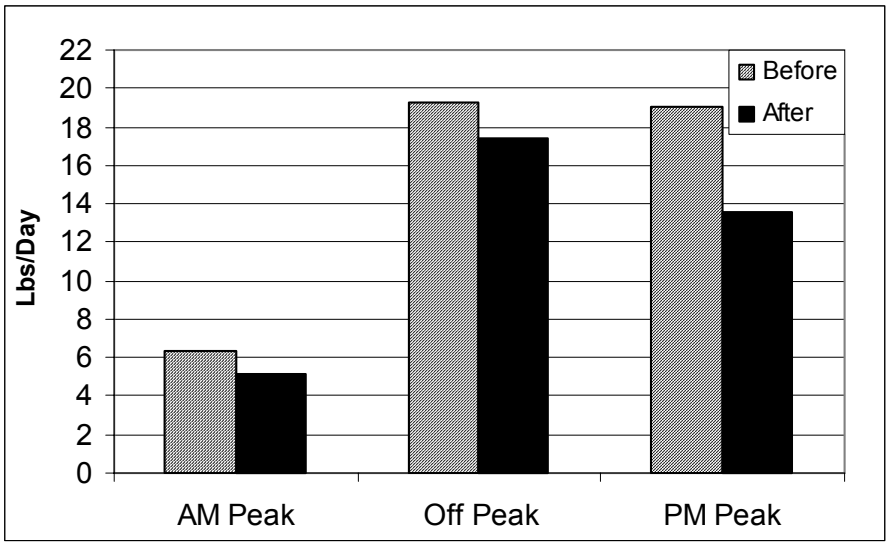
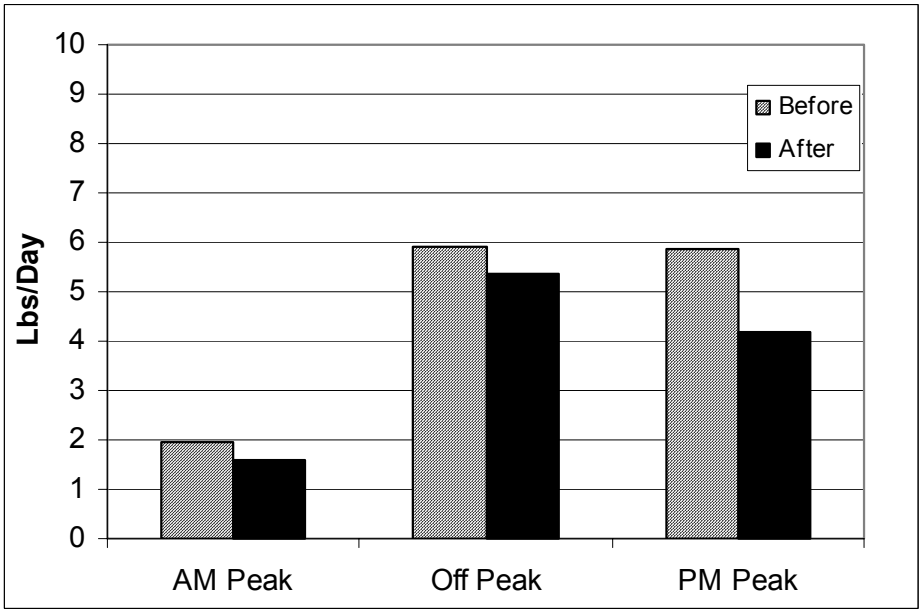


Figure K-12. Idling NOx Emissions before and after New Timing Cycle Implementation on the Jones Maltsberger System



Nacogdoches/Perrin Beitel Emission Reduction

The new timing cycles for the Nacogdoches/Perrin Beitel traffic signal system provided small emission reductions as well. The most emission reduction was noted in VOC emissions during the PM peak period, which amounted to two pounds per hour. The AM peak had an emission reduction of 0.6 pound per hour and the off peak period had an emission reduction of 0.3 pound per hour. Reductions in NOx emissions were small in all three periods, the AM peak period having a reduction of 0.15 pound per hour, off

peak had a reduction of 0.09 pound per hour and the PM peak had a reduction of 0.5 pound per hour.

This system had the lowest percentage reduction in emissions with only an overall reduction on 5 percent. Also, table K-31 show that this intersection had the second lowest reduction in overall emissions with (7 lbs for NOx and 2 lbs for VOC). The results are also displayed in figures K-13 and K-14.

Table K-31. Idling VOC and NOx Emissions for the Nacogdoches/Perrin Beitel Traffic Signal System, lbs/day

Time Period	VOC		NOx		Percent Change (VOC&NOx)
	Before	After	Before	After	
AM Peak	11.69	10.41	3.60	3.20	-10.95%
Off Peak	44.23	42.57	13.62	13.12	-3.68%
PM Peak	92.21	88.37	28.39	27.21	-4.16%
Total	148.12	141.35	45.61	43.53	-4.55%

Figure K-13. Idling VOC Emissions before and after New Timing Cycle Implementation on the Nacogdoches/Perrin Beitel System

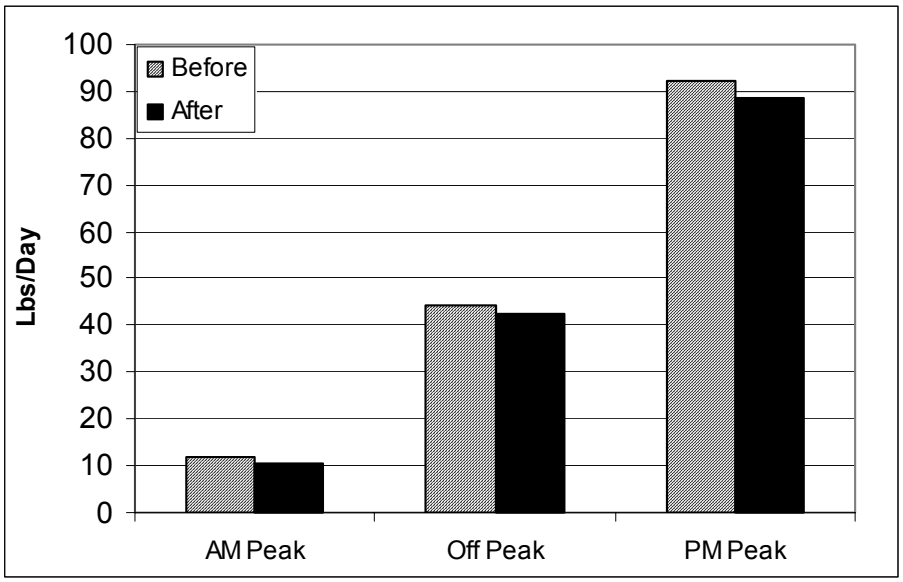
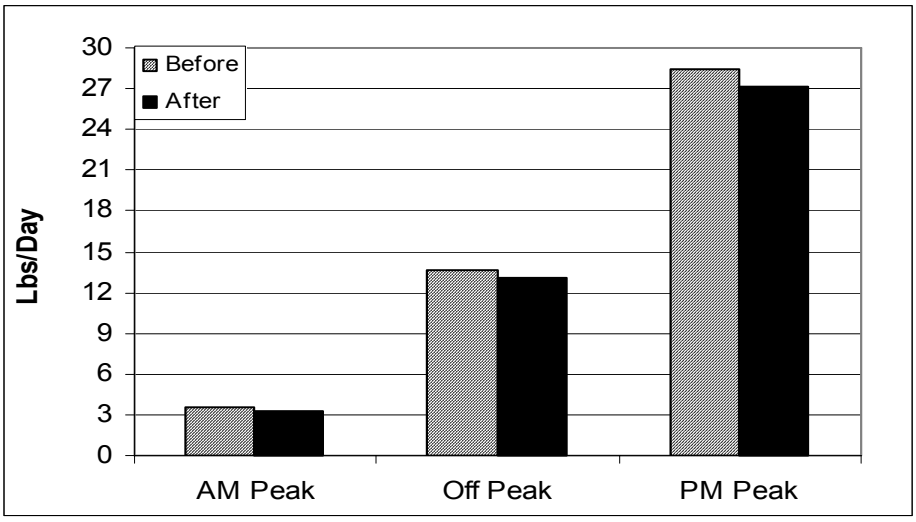


Figure K-14. Idling NOx Emissions before and after New Timing Signal Implementation for the Nacogdoches/Perrin Beitel System



The overall reduction of emissions over the selected time frame is illustrated in above Figure. There was a higher incidence of reduction in VOC emissions than in NOx emissions, however, for both precursors the highest reduction was noted in the PM peak hours followed by the AM peak hours. The figure graphically depicts the first modeling day for an example of the time curve. The graph shows that the PM peak emissions reductions were significant, while morning peak hour reductions were not as high as expected. The same trend was noted during all the days analyzed in the photochemical model.

Conclusion

Several steps were utilized to analyze selected traffic signal systems to estimate the emissions reductions due to the improved timing cycles. Preliminary evaluation of the traffic signal systems by Pape-Dawson Engineers, Inc involved data collection, design improvements, optimal timing plan development and implementation, and simulation of before and after conditions. Models, such as the TRANSYT-7F, Synchro 3.2, and PASSER II, were used in the evaluation and assessment of the traffic signal systems. These models provided simulation files, “before” traffic flow simulations, and optimal timing cycles for the traffic signal systems.

Analysis of the recommended timing cycles for the various traffic signal systems indicated reduction of ozone precursors if the cycles were implemented. The highest reduction was noted in the PM peak hours, followed by the AM peak hours, and then off peak had a consistent yet small reduction in VOC and NOx emissions.
The amount of the emission reduction is not a substantial amount to cause a notable and significant reduction in ozone levels. This could be due to the fact that few intersections were involved in the study rather than several hundred. If more systems had been involved with the study, then it would have been safe to assume that a great amount of reduced emissions could equivocate to a greater reduction in ozone levels.

Also, since most of the reductions occurred during the PM Peak Hours, the reductions had minimal impact on ozone levels. For the San Antonio area, on-road emissions

impacts ozone levels the greatest during the late morning and noon periods, while late afternoon on-road emissions have a minimal impact on ozone levels[22].

[22] For a further description please see San Antonio-Bexar County MPO, June 2002, "UPWP 3.12: Photochemical Analysis of Transportation Control Measures and Alternative Fuel Vehicle Fleets", San Antonio, Texas.

ENERGY EFFICIENCY / RENEWABLE ENERGY PROJECTS

On December 13, 2002, the TCEQ revised the Houston-Galveston (HGA) SIP to include a protocol for implementing and calculating reductions from energy savings resulting from state Senate Bill 5 and Senate Bill 7 measures. This revision was followed by a revision to the Dallas-Fort Worth (DFW) SIP on March 5, 2003, which included an estimate of NOx reductions associated with SB5 and SB7. (Source: EEIRE)

Since that time, efforts have been underway both to implement the energy reductions required by the state and to quantify the associated ozone precursor reductions. Air quality planners in the San Antonio region currently benefit from a partnership created by the TCEQ between AACOG, the Energy Systems Laboratory (ESL) of Texas A&M University, the local Metropolitan Partnership for Energy, and the Brooks Energy Sustainability Laboratory (BESL) of the Texas Engineering Experiment Station.

ESL is charged by the state to assist local entities subject to Energy Efficiency mandates with these reduction quantification estimates. Under a recently-signed Memorandum of Agreement, BESL is to assist the ESL with technical assistance as part of its duties under Senate Bill 5 by producing an inventory of energy use and savings from existing and planned (through 2007) energy efficiency and renewable energy (EE/RE) projects. The Metropolitan Partnership for Energy (MPE) is assisting these other entities in the identification and inventory of existing and planned EE/RE using its reasonable best efforts.

The TCEQ guidance, "Incorporating Energy Efficiency and Renewable Energy (EEIRE) Projects in the SIP" is being used to provide specific guidance to BESL on content and reporting requirements, including requirements for a spreadsheet to facilitate conversion into creditable NOx reductions by the ESL.

The inventory is due to contain EE/RE project data from local, State, Federal and major private sector companies such as USAA and Toyota.

Types of projects will include, but not be limited to:
1. State-mandated IECC building codes and above code construction as well as special rating programs such as Build San Antonio Green and LEED ratings;
2. Local distributed energy projects including PV, solar-thennal, and fuel cells; renewable energy projects from remote locations planned;
3. Local government energy improvement projects including water and wastewater, street lighting and traffic signals;
4. Major energy conservation retrofits for existing facilities including Continuous Commissioning®, major equipment and control upgrades, and cool roofs, etc.

Deliverables will include:
a) Development of inventory of creditable local area SIP EE/RE projects.
b) Final report in spread sheet format of existing and planned energy efficiency projects by category, level of energy savings or clean energy from renewable energy projects.

Although credit is not taken here for the Energy Efficiency / Renewable Energy Projects in the region, the benefits of the reductions accrue as Additional Evidence that the San Antonio region will reach attainment. With the completion of the work accomplished through this partnership, the San Antonio regional air quality planners will include the SIP credit available.

According to the very first draft efforts of the BESL/ESL/TCEQ/MPE/AACOG team, Energy Efficiency measures under Senate Bill 5 give the following reductions in energy production, in megawatt-hours per year (MWH/year):

- For Bexar County, the electricity savings are 18.179 MWH/year.
- For Guadalupe County, the electricity savings are 1.217 MWH/year.

With further research, these energy reductions will be quantified and precursor reductions located, as given in the outline above.

Executive Order 13123: Greening the Government Through Efficient Energy Management

Executive Order 13123 calls for Federal agencies to improve the energy efficiency of their buildings, promote the use of renewable energy, and reduce greenhouse gas emissions associated with energy use in their buildings, among other energy-related requirements. AACOG is working with several state sponsors to petition the federal government for emissions reductions credits for energy reductions in federal buildings. San Antonio has a high concentration of federal buildings subject to EO 13123. Just as credit for energy efficiency is afforded by state rules in Texas, credit should be available for energy efficiency measures installed in local federal buildings, as appropriate.

References:

"Incorporating Energy Efficiency and Renewable Energy (EEIRE) Projects in the SIP," February 5, 2004, Texas Commission on Environmental Quality, Austin, Texas

Federal Register Publication of Executive Order 13123 - Greening the Government Through Efficient Energy Management; published June 8, 1999. Online: http://www.eere.energy.gov/femp/pdfs/eo13123.pdf

PUBLIC EDUCATION

Introduction

The following pages describe the public outreach and education projects undertaken by AACOG staff for the purpose of disseminating information on air quality and informing the public of seriousness of air pollution problem in the San Antonio area. The main goal is to familiarize the public with actions they can take to improve the air quality.

Public Education to Encourage Voluntary Pollution Reduction Measures

The Air Improvement Resources Committee (AIR Co) has always recognized and will continue to recognize that public education is crucial to achieving long-term air quality improvement. Shortly after its formation, AIR Co created a Public Education subcommittee, comprised of public outreach specialists from local governments, utilities, and non-profits and chaired by AACOG staff, to oversee public outreach and education efforts.

The main goals of the Public Education committee are two fold; 1) to educate the public on the health risks posed by ozone pollution and how they can protect themselves, and 2) to encourage the public to take voluntary action to reduce ozone pollution. The primary method of basic ozone pollution and health education is the Air Quality Health Alert (AQHA) notification system and associated publicity and outreach efforts. The main voluntary pollution reduction measures advocated through publicity, paid media and presentations are:

Maintain your vehicle. (basic car care)
Drive less. (Commute Solutions, combining errands, walking and bicycling)
Don't idle. (Adopt-A-School Bus No-Idle Program)
Re-fuel in the evening.
Don't "top off".

To achieve its goals, the Public Education committee makes full use of advertising funds made available through grants from the Texas Commission on Environmental Quality, the Texas Department of Transportation, and, when available, the Environmental Protection Agency. In addition, AACOG staff makes significant efforts to obtain free publicity for air quality issues. Public education and outreach efforts, including paid advertising, publicity and other voluntary measures campaigns are summarized in the following paragraphs.

Air Quality Health Alert Notification System

AACOG provides and will continue to provide free AQHA notification for citizens, organizations, and companies within the region. The AQHA system informs citizens of TCEQ's forecast of high ozone pollution levels on a given day through emails and faxes distributed the afternoon prior to that day. The faxes not only advise recipients of the high ozone pollution forecast and advocate health protection, but also suggest voluntary measures that citizens can make year-round to help reduce ozone pollution. AACOG actively promotes this free service and has more than doubled the number of recipients in the last two years. As of March 2004, the number of registered recipients of AQHA notifications was approximately 1,000, many of whom spread the email to their entire organization, increasing the number of recipients to several thousand.

AQHA notifications are also provided to major media outlets and AACOG maintains relationships with those outlets to ensure that Alerts are broadcast with local news and weather. In the near future, AACOG hopes to increase pressure on local media outlets

to provide a daily Air Quality Index (AQI) report in addition to AQHAs. Past efforts have already resulted in daily AQI reports from two outlets, News 9 San Antonio (cable television news) and the San Antonio Express-News (primary metropolitan newspaper). As a part of actively promoting the AQHA notification system, AACOG staff routinely presents air quality and health issues to local community groups, businesses and students of all ages. Information on regional clean air policy and voluntary pollution reduction measures is and will continue to be included as a part of these presentations.

Paid Advertising

Paid advertising campaigns are broadcast on various local radio and television stations, in local newspapers, on highway billboards, and on Internet "hub" websites. Messages used promote clean air actions such as vehicle maintenance, fueling in the evening, and driving less by carpooling, combining errands, or using mass transit. A summary of paid media campaigns for 2001, 2002, and 2003 is available upon request as an example of standard advertising campaigns undertaken by this program. In general, the program advertises using radio "traffic" advertisements because they reach individuals where they are most susceptible to messages about alternate commuting, vehicle maintenance, and cleaner air: while they sit in their vehicles in traffic. The program also uses limited television advertising to convey both air quality and Commute Solutions promotion messages and, additionally, uses newspaper to advertise special events, such as the annual Ozone Season Kickoff event, which is described in later sections. The paid advertising budget is provided through the Alamo Area Commute Solutions grant funds from the Texas Department of Transportation. Advertising Commute Solutions transportation alternatives and their relation to improved air quality has been a major task in the Commute Solutions grant work plan for over five years and will continue to be as long as AACOG is the recipient of those grant funds.

Publicity

AACOG staff regularly issue news briefs, news releases, and Air Quality Health Alerts to local media in order to obtain coverage of air quality issues and events. Media coverage for 2001-2003, provided to show the continually increasing effort and result of AACOG staff work, is summarized in the table below:

Table K-32. Media coverage for 2001-2003

Media Coverage	2001	2002	2003	2004 Goals
Television Pieces	10	32	34	50
Radio Pieces	9	32	37	50
Print News Pieces	16	38	70	100

In 2003 alone, AACOG issued over 40 news items. AACOG staff will continue to issue news items and plans to increase the number of items issued each year.

Outreach Events & Presentations

AACOG staff also hosts and/or participates in community events, gives presentations to civic groups, and gives interactive lessons to student groups. As an example of the region's continuing commitment to educating individuals on a personal or small group basis, events, presentations, and interactive lessons given in the past three years are summarized below:

Table K-33. Outreach Activities

Outreach Type	2001	2002	2003	2004 Goals
Civic Group Presentations	27	23	34	50
School-Related Presentations	12	9	20	25
Events	18	19	27	40

At each of these outreach events or presentations, staff disseminates informational and promotional items to remind the public of ozone pollution's health effects and encourage individual voluntary pollution reduction measures. Materials are produced by AACOG through the Commute Solutions budget and are also donated to AACOG by various state and federal agencies, including the Texas Department of Transportation, the Texas Commission on Environmental Quality and the Environmental Protection agency. An example of this materials dissemination lies in the first eight weeks of 2004, in which staff has distributed over 4,000 items and reached over 1,600 individuals.

Website

In addition to external outreach efforts, AACOG staff maintains an air quality website, www.aacog.com/air, that provides extensive information on ozone pollution, its causes, its health effects, and voluntary measures citizens can take to help reduce the pollution problem. The website is constantly updated and expanded, providing weekly air quality facts and the latest news on air pollution and policy issues. Beyond just providing information, the website allows users to make requests of staff, including online registration for the AQHA program, informational and promotional materials requests and requests for air quality presentations for students or organizations.

Alamo Area Commute Solutions Program

The Alamo Area Commute Solutions Program, funded by the Texas Department of Transportation, seeks to reduce traffic and air pollution by promoting commute alternatives, including:

RideShare (carpooling and vanpooling)
Alternate Schedule (compressed work week and flex scheduling)
Mass Transit
Telework
Bicycling and Walking

The Commute Solutions Program has experienced great success in the past by targeting not only individual commuters with radio and television outreach, but by approaching businesses to institute Commute Solutions programs as benefits for their employees. Over 4,000 individuals currently participate in the Commute Solutions program. Commute Solutions will continue to increase success by further targeting outreach to companies through the Best Workplaces for Commuters program. As this program allows employers to receive substantial tax savings and improved public image by meeting a national standard of excellence in commuter benefits, it is a much improved tool for encouraging and actually achieving a reduction in single occupancy vehicle travel and, hence, air pollution.

In addition, Commute Solutions promotes and assists with the implementation of two commute assistance programs for schools, SchoolPool and Walking School Bus. By reaching out to parents and schools through Parent Teacher Association meetings,

mailings, and contact with administrators, Commute Solutions staff establishes and maintains School Pool and Walking School Bus programs that allow parents to share the responsibilities of driving or chaperoning a group of walking children on the way to and from school. This reduces the number of cars idling in the school's student pick-up/drop-off zone, which directly reduces pollution and also improves safety by reducing potential student-vehicle interaction in the parking lot.

All Commute Solutions services are available through the Commute Solutions website, www.aacog.com/commutesolutions, which is constantly updated and expanded. This website will be maintained throughout the coming years and will be used to provide ever quicker, more responsive, more accurate services to the region's commuters.

Adopt-A-School Bus Idling Reduction Program

Through the Adopt-A-School Bus grant, AACOG is embarking upon a new air quality outreach campaign focused on idling reduction. The No Idle program will educate students, parents, teachers and administrators on the air quality improvements possible through reduced idling, both by buses and passenger vehicles, during student drop-off and pick-up. The program will encourage drivers to "Clean it up. Turn it off. Keep it Green." by turning off their passenger vehicle engines when the vehicle will remain idle for more than ten seconds. Similar idling limits will be sought of bus drivers.

The main methods for this outreach will be personal contact and presentations to students, parents, school staff, and bus drivers. Students will participate as a "Green Patrol", tracking and rewarding drivers who are not idling. Parents and bus drivers will take the "No Idle Pledge." Schools will become certified "No Idle Zones."

Though schools will be the first focus of this program, once success is achieved at the schools, the program will be expanded to encourage reduced idling while waiting in parking lots and drive-through lanes.

A projected replacement of 275 school buses for the San Antonio area over the course of three school fiscal years could realize a reduction of approximately 110 tons/year of NO_x and 11 tons/year of PM. There would be an added benefit of a substantial reduction in the emissions of air toxins as well. There could be a combination of replacement and retrofitting of buses to achieve NO_x and PM reductions, depending on technology available and the availability of low-sulfur fuel.

LAWNMOWER RECYCLING PROGRAM

Introduction

Lawnmowers, rotary tillers, lawn and garden tractors, leaf blower/vacuums, and chainsaws are examples of this residential equipment category. When aggregated, residential equipment represents a major source of emissions that contribute to the pollution of air. There are ongoing efforts, with a degree of success, in the San Antonio area to mitigate pollution generated by residential lawn and garden equipment. In the following pages these efforts and attributed emissions benefits are discussed.

Calculating Emission Factors

An essential part of calculating residential equipment emissions is the use of an accurate emission factor (EF) for each pollutant. In the process of 1999 emission inventory, AACOG staff developed techniques for calculating residential equipment EFs, which have been documented in a report entitled " *1999 Emissions Inventory for the Alamo Area Council of Governments Region, August 2001*." These EFs will be used here to calculate the amount of emission reduction due to the CPS's "Mow Down Smog" lawnmower recycling initiative. The followings, taken from the above mentioned report, will describe this calculation procedure in more detail.

"In an effort to find more recent and specific equipment type EFs, EPA's recently updated (April 2000) Nonroad Emission Inventory Model was used.[23] The EFs for residential equipment were developed using the following process:[24]

A 1999 Nonroad Model run for residential equipment was done for Texas.
The output from this run was used to obtain the following for all types of residential equipment:
HC, CO (i.e., a colorless, odorless and tasteless gas released primarily by incomplete combustion of fossil fuels) and NO_x (i.e., a group of gases released by the combustion of fossil fuels and natural sources such as forest fires, lightning and decaying vegetation) emissions in tons/year for each type of equipment
Equipment populations (Eqmt. Pop) for each type of equipment
The Nonroad Model input file activity.dat, was then used to obtain the following values:
The activity rate of each type of equipment in hrs/yr. (HRS)
A LF (the average power level at which the engine operates divided by the maximum available power) for each type of equipment
The average horsepower (Avg. hp) for each type of equipment was then determined from the Nonroad Model input file Tx.pop.
With all the factors in place, EFs for HC, CO, and NO_x were then calculated using the following formula:

EF (g/bhp-hr) = (tons/year of pollutant) x (2000 lbs./ton) x (453.6 g/lb.)/ (Eqmt. Pop) x hrs/yr.) x (Avg. Hp) x (LF)

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[23] U.S. Environmental Protection Agency, 1992. Procedures for Emission Inventory Preparation, Volume IV: Mobile Sources. Research Triangle Park, NC., and U.S. Environmental Protection Agency, 1991. Nonroad Engine and Vehicle Emissions Study Report. Washington, DC.

[24] U.S. Environmental Protection Agency, 2000. Nonroad Emission Inventory Model. Ann Arbor, MI.

The resulting EFs are used in calculating emissions from each type of equipment."

For reference, the following tables, which describe the residential equipment parameters and the calculated EFs for the residential equipment, reported in the above mentioned 1999 EI, are presented in this appendix:

Table K-34: Residential Equipment

Residential Equipment Parameters		
Equipment Type and Category	Average Horsepower (HP)	Load Factor (LF)
RT/R/2S	2.321	0.4
RT/C/2S	2.321	0.4
CS/R/2S	2.110	0.7
CS/C/2S	3.532	0.7
LV/R/2S	1.363	0.94
LV/C/2S	1.956	0.94
LM/R/4S	4.070	0.33
LM/C/4S	4.070	0.33
RT/R/4S	4.712	0.4
RT/C/4S	4.712	0.4
LV/R/4S	3.420	0.94
LV/C/CS	10.924	0.94
RERM/R/4S	10.657	0.38
RERM/C/4S	10.657	0.38
FM/C/4S	13.519	0.65
OLGE/R/4S	5.356	0.58
OLGE/C/4S	5.387	0.58

Table K-35: Emissions Factors

Calculated EFs for Residential Equipment (grams/hp-hr)							
Equipment Type	VOC					CO Exhaust	NOx Exhaust
	Exhaust	Crank	Diurnal	Displ.	Spillage		
LM/R/4S	52.0869	2.0697	3.3551	0.8595	7.2977	658.3792	2.7479

The next step in our calculation process entails estimation of length of time that a typical lawnmower is used in San Antonio area. By applying the EFs for NOx and VOC emissions to this length of time, the amount of emissions generated by a typical residential lawnmower can be calculated.

Lawnmower Usage Time
This length of time, according to the 1999 EI report, is 35.9872 hours per a year for Bexar County, which is the assumed area of interest for this calculation and the CPS's "Mow Down Smog" recycling program. Table K-36 illustrates how this usage time has been calculated.

Table K-36: Adjusted Lawnmower Usage Time

How many hours per summer week is the gasoline powered lawnmower used?					Lawnmower Use Ratio	Use (hr/yr.)
Choice (minutes per week)	Survey Response	Survey Response Ratio	Adjusted Survey Response	Adjusted Survey Response Ratio		
None	14	0.0388	0	0.0000	0.8643	0.0000
0-15	11	0.0305	11	0.0353		0.1234
15-30	24	0.0665	24	0.0769		0.8077
30-45	50	0.1385	50	0.1603		2.8045
45-60	75	0.2078	75	0.2404		5.8894
60-90	48	0.1330	48	0.1538		5.3846
90-120	25	0.0693	25	0.0801		3.9263
120-150	30	0.0831	30	0.0962		6.0577
>150	49	0.1357	49	0.1571		10.9936
Don't know	35	0.0970	0	0.0000	Total Use	35.9872
Total	361	1.0000	361	1.0000		

Emissions Reductions Amounts

The next step is to calculate the emission reduction amount (pound/day) due to the recycling of 4-cycle residential lawnmowers for emissions of VOC (exhaust, crank, diurnal, displacement, and spillage), CO exhaust, and NOx exhaust categories in Bear County. This process entailed use of EFs from Table K- 37 for LM/R/4S equipment and the following formula from 1999 EI report.

Emissions for VOC, NOx, and CO = EP x HRS x HP x LF x EF

Where:

EP = equipment population
HRS = annual hours of use
HP = average rated horsepower
LF = typical load factor
EF = average emissions of pollutant per unit of use

Table K-37 illustrates the results of this calculation for all VOC, CO, and NOx categories in Bexar County.

Table K-37: Reduced Emissions from "Mow Down Smog" Recycling Program

2003 Emission Reduction due to City Public Service "Mow Down Smog" Program *pound per ozone season day**						
Emission	Exhuast	Crank	Diurnal	Displ.	Spillage	Total
VOC	90.62	3.60	5.84	1.50	12.70	114.24
NOx	4.78					4.78
CO	1145.39					1145.39

**Ozone season in 1999 EI report consists 196 days*

TRUCK STOP ANTI-IDLING PROGRAM

IdleAire provides individual electrical service for 53 parking spaces at the Trans America Truck Stop the intersection of Foster Road and IH-10 East. This has traditionally been referred to as “truck stop electrification (TSE).” On top of TSE, IdleAire provides other layers of services that comprise Advanced Travel Center Electrification (ATE), a flexible package that can be altered and customized to industry needs. Currently, a heating, cooling and ventilation unit sits above each parking space. The unit is connected to the Service Delivery Module by means of a flexible, reinforced, concentric hose, which also houses the delivery mechanisms for the communications and entertainment packages. All TSE and ATE services, including temperature, fan speed and all other service selections, are delivered to and independently controlled by each individual driver in the truck cab via the Service Delivery Module.

The IdleAire system *removes 100% of emissions associated with extended diesel idling,* including nitrogen oxides (NOx), particulate matter (PM), volatile organic compounds (VOC), carbon monoxide (CO) and carbon dioxide (CO2). The system has a net reduction of 98% of criteria pollutants under the Clean Air Act after accounting for the electricity from the grid used to power the system, and an overall 83% net emissions reduction. *Per each parking spaces each year (assuming 60% utilization)*, those diesel emissions amount to an estimated .71 metric tons of NOx, .014 tons of PM, .036 tons of VOC, 54.65 tons of CO2, and .30 tons of CO totaling 55.71 metric tons a year. Applied to the 53 parking spaces at this facility, those emissions would amount to about 2952.63 tons each year. The IdleAire system saves 100% of the diesel fuel associated with extended diesel idling, approximately 1.0 to 1.1 gallons per hour.

WALKING SCHOOL BUS PROGRAMS

Walking School Bus programs help provide a safe and healthy way for young students to travel to and from school while also decreasing vehicle-related pollution, increasing child activity, and relieving parents of extra morning stress. Currently, many students who live near schools, instead of riding the bus, are driven to and from school by their parents. Both the additional vehicle miles traveled and vehicle time spent idling due to parental drop-off and pick-up are sources of air pollution. Walking School Bus matches parents of non-bus riding students who live near one another and attend the same school. The matched parents are then advised to set up a schedule by which they divide chaperoning duties for a small group of students on their walk to school. Parental supervision increases the safety of the student walkers and thus eases parent fears about allowing their children to walk rather than be driven. Walking to school provides the students with healthy daily activity, and, with fewer vehicles making the home-to-school commute air pollution and parental stress are significantly reduced.

Lower Reid Vapor Pressure

Fuel control measures are effective strategies for states to use to reduce ozone pollution. The two primary approaches to fuel controls are state opt-in to the federal RFG program subject to certain conditions, and state adoption of a low Reid Vapor Pressure (RVP) requirement that is more stringent than the applicable federal RVP requirement. While both approaches reduce volatile organic compounds, which are precursors to ozone, they differ in their overall environmental benefits, whether the state or federal government administers them, and the statutory provisions governing their adoption.

About Credits for Lower RVP Under an Early Action Compact

In general, the Clean Air Act (CAA) provides that states are preempted from adopting their own fuel control requirements different from existing federal requirements. However, EPA may waive preemption under certain circumstances.

State opt-in to the RFG program is not preempted because EPA establishes and enforces the federal RFG requirements at the federal level and the Act provides explicit authority for states to opt-in to the federal requirements under section 211(k).

State adoption of low RVP gasoline requirements is controlled by section 211(c)(4) of the CAA. Section 211(c)(4)(A) prohibits[25] states from prescribing or attempting to enforce any "control or prohibition" of a "characteristic or component of a fuel or fuel additive" if EPA has promulgated a control or prohibition applicable to such characteristic or component under section 211(c)(1). This preemption does not apply if the state control is identical to the federal control. Section 211(c)(4)(C) provides an exception to this prohibition for a non-identical state standard contained in a state SIP where the standard is "necessary to achieve" the primary or secondary NAAQS that the SIP implements. EPA can approve such a state SIP provision as necessary if the Administrator finds that "no other measures that would bring about timely attainment exist," or that "other measures exist and are technically possible to implement, but are unreasonable or impracticable."

The 7.2 psi gasoline RVP of for the San Antonio region was proposed after undertaking careful and in depth modeling, cost-benefit analysis, and consideration of sentiments of the local communities and their elected officials. The local refineries have also been contacted to determine their ability to produce and market this fuel with considerable competition among each other. It was determined that the refiners were technologically capable of producing the proposed gasoline fuel and the market forces would drive the at-pump price.

If allowed, adoption of this fuel during the ozone season is expected to help reduce emissions of VOCs and NOx by 2.1 and 0.05 tons/day respectively. The requirement for gasoline refineries to provide such gasoline will only be during the months of March through October, which is usually the time of the year ozone levels exceed the national standard in San Antonio region. Currently, the State's Regional Low RVP Gasoline program requires that low RVP gasoline be used in 95 central and eastern Texas

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25 Federal Clean Air Act, Sec. 211. (a)(4)(A) "Except as otherwise provided in subparagraph (B) or (C), no State (or political subdivision thereof) may prescribe or attempt to enforce, for the purposes of motor vehicle emission control, any control or prohibition respecting any characteristic or component of a fuel or fuel additive in a motor vehicle or motor vehicle engine." Available online as http://www.epa.gov/oar/caa/caa211.txt.

counties during the summer months when ozone pollution is at its worst. The program, which began May 1, 2000, requires that all gasoline sold from retail gasoline-dispensing facilities within the affected counties have a maximum Reid vapor pressure of 7.8 psi from June 1 through October 1 of each year. Gasoline suppliers are required to supply low RVP gasoline to the affected counties from May 1 through October 1 of each year.

Credit Calculations
Adoption of 7.2 psi fuel during the ozone season is expected to help reduce emissions of VOCs and NOx by 2.1 and 0.05 tons/day respectively. The requirement for gasoline refineries to provide such gasoline will only be during the months of March through October, which is usually the time of the year ozone levels exceed the national standard in San Antonio region.

Reduction Calculations Methodology Overview
Modeling scenarios with the MOBILE6 model indicated that lowering the RVP in gasoline to 7.2 from 7.8 would reduce emissions from the on-road mobile fleet in the SAER counties. The table below lists the emission reduction percentages for each of the SAER counties.

Reductions for SAER counties with RVP 7.2 gasoline, compared with RVP 7.8.

County	VOC % Reduction, 2007 On-Road Mobile Fleet	NOx % Reduction, 2007 On-Road Mobile Fleet
Bexar County	4.18	0.06
Comal County	3.73	0.05
Guadalupe County	3.69	0.05
Wilson County	3.14	0.06

The percentage reduction of precursor emissions was used to calculate actual reductions. The actual reduction was estimated by multiplying the 2007 daily on road emissions total for each county with the emission reduction percentage. The resulting number was then divided by 100 to provide the emission reduction total in tons per day.

(2007 tons/day VOC x emission reduction %) / 100 = 2007 tons/day of VOC reduced)

References:

Texas Commission on Environmental Quality (TCEQ), 2000. "Dallas/Fort Worth Attainment Demonstration." Available online: http://www.tnrcc.state.tx.us/oprd/rule_lib/4dfwsip.pdf

Energy Generated from Wind

Wind is a natural resource that is constantly replenished, supplying energy to wind turbine installations in 26 states. Second only to North Dakota[26], the state of Texas is a leader in wind energy potential (average megawatts of capacity), with an annual energy potential of some 1,190 billion kWh and an average power output of 136,000 megawatts.[27]

While numerous wind farms in Texas have been built over the past few years, it is clear that the opportunity for generating additional electricity from the wind is huge. The *Pacific Northwest Laboratory*[28] has mapped the wind resources available nationwide and published their findings as the Wind Energy Resource Atlas of the Unites States.[29] If one browses the atlas, it will become clear that the wind in many states, including Texas, represents a good energy resource.

San Antonio City Public Service (CPS), the provider of electricity to the San Antonio region, has purchased all of the power produced at the Desert Sky wind farm under a long-term contract.[30] Located in West Texas, just north of Interstate 10 about 45 miles east of Fort Stockton, Desert Sky wind farm has a power generation capacity of 160,500 kilowatts, enough power to supply about 40,000 average American homes. The electricity from the site flows into the Electric Reliability Council of Texas (ERCOT) power transmission network that serves CPS's customers in the San Antonio area.

City Public Service intends to use energy generated from wind in place of fossil fuels (coal, oil, and natural gas), for the purpose of keeping the amounts of NOx and VOC emissions at current or lower levels. CPS proposes to have an additional 150 MW of renewable energy capacity by 2012.[31]

Emission Reduction Estimates due to Wind Power

In the following table we have estimated the emissions reductions due to the use of wind power produced by the Desert Sky facility.

First, the 2002 and 2003 electricity consumption levels by CPS customers are compared and the 2007 consumption levels are forecasted. Given the corresponding levels of NOx and VOC produced agency wide by CPS power production facilities, a correlation is developed between power consumed by CPS customers and emissions produced by CPS facilities.

Given also the historical and forecast supply of electricity produced by wind power, if the electricity produced by wind supplants the electricity produced by traditional non-renewable CPS power production facilities, then the corresponding reduction in fuel

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[26] Source: An Assessment of the Available Windy Land Area and Wind Energy Potential in the Contiguous United States, Pacific Northwest Laboratory, August 1991. PNL-7789, as quoted online: http://www.awea.org/faq/tutorial/wwt_potential.html - How%20much%20energy

[27] American Wind Energy Association, available online: http://www.awea.org/projects/texas.html

[28] Pacific Northwest Laboratory homepage: http://www.pnl.gov/

[29] The Wind Energy Resource Atlas of the Unites States, available online: http://rredc.nrel.gov/wind/pubs/atlas/

[30] Desert Sky Wind Farm: http://www.desertskywind.com/

[31] http://www.citypublicservice.com/energyplan/faq/seven.asp

consumed by traditional power production represents a net reduction in traditional emissions as well. It is this hypothetical reduction which is calculated here.

Sample Calculation: In 2002, the total electrical consumption by CPS customers was 14,705 gigawatthours (GWh), and CPS estimates that, system-wide, their facilities produced about 11,855 tons of NOx in 2002, which averages out to 1612.4 lbs. NOx per GWh. During 2002, Desert Sky produced about 352 GWh yearly. Supposing the electricity produced by Desert Sky supplanted the electricity produced by traditional non-renewable CPS power production facilities, then 352 GWh x 1,612.4 lbs. NOx / GWh represents a yearly savings of 567,564.8 lbs. or 283.78 tons of NOx in 2002.

Overall for the year 2007, emissions of 1.51 tons of NOx and 0.03 ton of VOC are forecast to be avoided on a daily basis.

Impacts of Wind-generated Electricity on Ozone Precursors in Bexar County

Annual Consumption (GWH) / Year	Wind Power Energy Production (GWH) / Year	Pollutant	Total Yearly Emission Pound	Pound Emission per GWh	Yearly lbs Avoided	Yearly Ton Avoided	Daily Ton Avoided
Year 2002 14,705	352 / 2002	NOx	23,710,000	1612.4	567,557	284	0.78
		VOC	352,000	23.9	8,426	4	0.01
Year 2003 13,478	376 / 2003	NOx	22,252,000	1650.99	620,771	310	0.85
		VOC	380,000	28.2	10,601	5	0.01
Year 2007 15,568	764 / 2007	NOx	22,400,000	1438.8	1,099,281	550	1.51
		VOC	380,000	24.4	18,649	9	0.03

The Texas Emissions Reduction Plan (TERP)

"The Texas Emissions Reduction Plan (TERP) is a comprehensive set of incentive programs aimed at improving air quality in Texas. The Texas Commission on Environmental Quality (TCEQ) administers TERP grants and other financial TERP incentives. The Legislature established the TERP in 2001. TERP includes a number of voluntary financial incentive programs, as well as other assistance programs, to help improve the air quality in Texas.

The goals of the TERP, as set forth in SB5, are to:

- Assure that the air in this state is safe to breathe and meets minimum federal standards established under the Federal Clean Air Act (42 U.S.C. Section 7407);
- Develop multi-pollutant approaches to solving the state's environmental problems; and
- Adequately fund research and development that will make the state a leader in new technologies that can solve the state's environmental problems while creating new business and industry in the state."

Funding for TERP projects for the San Antonio region was first available during the 1st round of FY 2004 grants. There are two major local grants for which contracts are signed: one for the public utility of San Antonio, City Public Service (CPS) and one for the city's public transportation service, VIA Metropolitan Transit. In total, 0.47 tons per day is available under contracts signed for FY 2004 Round 1 grants.
"Incentive funding was also expected to be available to help achieve reductions in counties located in the other two non-attainment areas (Beaumont-Port Arthur Area and El Paso County) and in designated near non-attainment areas, where air quality is approaching non-attainment levels."

According to the TCEQ's calculations about 0.47 tons per day for at least the five years of the grant period, through 2007 at least, are available under signed contract. Given that there is a debate about continuing the TERP program funding, claiming local SIP credit for local TERP projects across Texas may help the TCEQ Commissioners justify continuance of the TERP program to the Legislature. Claiming local SIP credit for TERP projects in the San Antonio Clean Air Plan should aid TCEQ in prioritizing future funding needs.

During the June 23, 2004, meeting of the Air Improvement Resources Executive Committee, the committee formally resolved the following, in a letter signed by the Chair and Vice Chair and addressed to TCEQ Chairman White:

> Due to the aggressive promotion of the TERP grants available to our region for just this one cycle and the two accompanying workshops held at the Alamo Area Council of Governments with TCEQ's partnership, some 0.47 ton per day in NOx reduction should be available to our region in 2007. This is the total reduction secured for our region through signed contracts from the FY 2004 1st round.
>
> We understand that the FY 2004 2nd round of these TERP grants is now being finalized. As with so many other federal, and state, level clean air quality planning efforts, we continue to benefit from these TERP related efforts.
>
> We wish to see the TERP program continue beyond the current expiration date (2008) for funding given in HB 1365. Hence, we would request that the TCEQ seek approval for an extension of the program past this date. By maximizing the TERP funding available to our region we can pursue these reductions on behalf of both the state and our region.

The signatories to the San Antonio regional Early Action Compact intend to pursue TERP grants and to work with other public and private sector entities operating in the region to pursue grants that will result in total NOx reductions of at least 2 tons per day. This is a commitment by us which is aided by the 0.47 ton per day given by the existing FY 2004 1st round signed contracts.